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Limited health literacy in primary care physiotherapy: Does a physiotherapist use techniques to improve communication?

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ABSTRACT

Objectives: Research shows that health professionals should adapt their communication when addressing patients with limited health literacy (HL). However, the extent to which physiotherapists apply recommended communication techniques is unclear.

Methods: We conducted a two phase mixed-method study, first holding focus group interviews among patients and experts on communication to explore the need for adjusted communication in physiotherapist–patient interaction. Second, we manually coded audio recordings of primary care physiotherapy consultations to investigate the extent to which physiotherapists applied these recommended communication techniques, and adjusted their communication towards patients with lower education.

Results: Focus group interviews identified four categories of communication elements: the teach-back method, medical jargon explanation, summarizing patient's narratives, and checking patient's understanding. In 50 audio recordings we identified 2670 clauses. We report limited use of the recommended communication techniques; the teach-back method was used in 2% of consultations (95%CI: 0.4%−10.5%) while medical jargon explanation was used in 84% (95%CI: 71.5%−91.7%). Mixed effects logistic regression models showed no association between lower education and communication techniques.

Conclusion: Although physiotherapists need to adjust their communication to patients with lower education, they rarely apply the recommended communication techniques.

Practice implications: Knowledge about limited HL among physiotherapists needs to be increased.

1. Introduction

Limited health literacy (HL) poses a serious problem for the individual and for the healthcare system [1,2]. HL is linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise, and apply health information in order to make judgments and take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve quality of life during the life course [3]. A survey conducted in eight European countries in 2011 showed that 12% of the respondents had insufficient HL and 47% of the respondents had limited (insufficient or problematic) HL [2]. Limited HL is associated with higher levels of anxiety [4–7],

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diminished self-management of chronic diseases, and decreased use of preventive health services [1,8]. As a result, limited HL is associated with poorer health outcomes in chronic conditions [9–14], and higher health care costs [15,16]. These implications of limited HL are amplified in an increasingly complex healthcare system. As a result HL has evolved to a major topic of health policy and reform [17].

In the context of physiotherapy, a study in the Netherlands showed that patients with lower Socio Economic Status (SES) use primary care physiotherapy 20–50% more often than patients with higher SES [18]. A recent study in the Netherlands stated that patients with a lower SES, as indicated by a low educational and income level, had higher healthcare expenditure and used more healthcare than those with the highest educational and income level [19]. Since low SES is strongly associated with limited HL [20], it is reasonable to assume that a substantial number of physiotherapy consultations are with patients with limited HL.

People with limited HL often have lower levels of education and have insufficient reading, writing, and numeracy skills [21,22]. Patients therefore rely on their physician's spoken word, but have more difficulty understanding what has been said, as physicians tend to use medical jargon and do not always check their patient's understanding [23–26]. Although the physician-patient relation is different from the physiotherapist-patient relation in that there is more emphasis on physical examination in the physiotherapist-patient encounter [21]. However, many parallels exist, and the difficulty in understanding spoken words may also apply in physiotherapy, where a substantial part of the consultation is spent on verbal communication [27–29].

Improving patient-provider communication is considered an important strategy to reduce the impact of limited HL [30]. The literature recommends several communication techniques to enhance provider communication with patients with limited HL [17,31]. An example is the use of the teach-back technique [32], which helps determine whether the information was understood by asking the patient to explain what they have heard in their own words [21,26,33–35]. Other recommendations are the use of short sentences and avoidance of medical jargon [21]. All of these general reccomendations could also be applied by physiotherapists. We know that adequate patient-provider interaction in physiotherapy has a positive impact on patient outcomes [36,37]. However, little is known about whether and how physiotherapists should adapt their verbal communication when encountering patients with limited HL [38,39]. Only one mixed-method study in chronic low back pain which examined the relationship between HL and the understanding of information given by physiotherapists [40]. The study reported that regardless of the level of HL, the use of complex medical terminology hindered patients' understanding of information.

To date, it is unclear which communication recommendations, if any, are used in physiotherapy practice. Furthermore, the extent to which these techniques are used in the physiotherapist interaction with patients with limited HL remains unknown. Therefore, the aim of this study is two-fold 1) to explore which verbal communication techniques are considered relevant by both communication experts and patients for patients with limited HL, and 2) to investigate the extent to which physiotherapists apply these recommended communication techniques in their consultations, and whether they adjust their verbal communication for patients with lower education, which is used as a proxy measure for limited HL.

2. Methods

2.1. Design

This two-phase mixed-method study included both a qualitative and quantitative approach. Phase 1 included semi-structured focus group interviews with patients and experts on communication with individuals with limited HL. In phase 2, we conducted a quantitative assessment of language use during first physiotherapy consultations of patients with musculoskeletal disorders in primary care. The focus of this study is on communication during the first consultation of patients with musculoskeletal conditions. During the first consultation, the physiotherapist aims to clarify the patients' health problem (history taking, physical examination, explanation of diagnosis and agreement on therapeutic goals) and therefore most of the consultation is spent on communication, contrary to follow-up consultations which often mainly consist of supervising exercises.

This study was approved by the Ethical Research Committee of the HAN University of Applied Sciences in Nijmegen, the Netherlands (EACO 145.04/19).

2.2. PHASE 1: focus group interviews

In the focus group interviews, we explored which verbal communication techniques are considered relevant by physiotherapist – patient interaction for patients with limited HL. The qualitative study reported in this manuscript followed the Standards for Reporting Qualitative Research (SRQR) [41].

2.2.1. Recruitment of participants

For the two focus group interviews we applied purposive sampling [42]. One focus group interview included experts on communication with individuals who have limited HL. The second focus group was conducted with individuals with low literacy as a proxy for limited HL.

Participants for the expert focus group were recruited from the researchers' personal network and included practicing physiotherapists, primary care physicians, employees of the regional Public Health Service (Gelderland Province, the Netherlands) and researchers in the field of communication. They were approached by email and telephone. Participants were eligible if they had contact with individuals with limited HL on a regular basis or were involved in policy making or research in this group.

Participants for the limited HL focus group were recruited by an employee of the Public Health Service. Because of their low literacy, the participants of the second focus group were approached by telephone. Informed consent forms for the low literate individuals were reviewed and adjusted for comprehensibility to the target group by an expert. Participants of both focus groups were included after signing the informed consent form.

2.2.2. Interview procedure

Each focus group interview was conducted by two researchers (ES and GR). The interview was guided by a moderator (ES). GR ensured that all participants were involved in the discussion, managed the time, and took notes. The interview guides of both interviews were developed using general knowledge derived from literature on communication with individuals with limited HL (see Appendix 1) [43–47]. In addition we used the findings from the expert interview to supplement the interview guide for the individuals with limited HL (Appendix 1). Questions were created to gain insights into: 1) problems that individuals with limited HL encounter in physiotherapy care; 2) recognizing limited HL, and 3) applying adequate communication techniques.

Each focus group interview started with an introduction, including the aim of the meeting. Participants were asked to speak freely and to respond to each other. With participants' permission, interviews were audio recorded using a Zoom H1 audio recorder.

2.2.3. Analysis of the focus group interviews

The two focus group interviews were transcribed verbatim and analysed using a directed approach to content analysis [48]. Based on findings from the literature, we developed an analytic framework including four communication techniques recommended for individuals with limited HL as codes: the avoidance of medical jargon, the use of teach-back method, asking the patient's understanding, and

summarizing [21,43–47].

Using the framework, we assigned codes to the expressions made by interview participants. Codes with comparable content were merged into categories. Any discrepancies in coding between researchers were discussed in order to reach consensus. Relevant expressions that could not be assigned to a category were categorized as free notes. In a second round, the researchers (ES and GR) discussed the free notes and, if applicable, assigned them to a new category. The software package Atlas.ti version 8 was used for analysis.

2.3. PHASE 2: quantitative assessment of physiotherapy consultations

In Phase 2, we assessed the use of verbal communication techniques recommended in the literature [43–47] and those identified in Phase 1 in physiotherapy consultations. In order to investigate whether physiotherapists applied these recommended techniques in their consultations and adjusted their communication for patients with lower educational level, participating physiotherapists were asked to make audio recordings of first primary care consultations of patients with a musculoskeletal condition.

2.3.1. Recruitment of participants

Physiotherapists were recruited through convenience sampling [49]. Physiotherapy practices in several parts of the Netherlands with a lower SES were approached by email, telephone, or face-to-face visits to invite physiotherapists to participate. If interested, an information letter was sent. The information letter included an informed consent form which participants were asked to sign. Because the physiotherapists were responsible for including patients, they also received information letters for their patients, together with an informed consent form.

Patients were included if they were visiting their physiotherapist for the first time for the specific musculoskeletal condition. Foreign language participants were only eligible if they were of Dutch origin or had lived in the Netherlands since early childhood to prevent misinterpreting limited language proficiency with limited HL. Exclusion criteria were: complete inability to read and write, and neurologic or psychiatric conditions.

2.3.2. Data collection and procedure

Physiotherapists completed a short form about their work experience and their specialization. Patients completed a short questionnaire to assess demographics, including education level which was used as a proxy measure for either limited HL or sufficient HL. The physiotherapists audio-recorded the complete first consultation with the patient. The consultations were transcribed verbatim.

2.3.3. Coding procedure of physiotherapy consultations

A codebook was developed based on the results of the focus group interviews and the literature [50]. The codebook described criteria to categorize relevant clauses from the text in terms of communication techniques. The codebook was refined and tested by two coders (ES and GR). After adjustments, ten consultations were double-coded and inter-rater agreement was calculated with Cohen's Kappa (K). Therefore, two coders (ES and GR) independently identified relevant clauses. Physiotherapists' clauses about patients' musculoskeletal condition were identified as relevant ($\kappa = 0.676$). After identification, the two coders assigned the clauses to the following categories of communication techniques: use of medical jargon (with explanation, without explanation or no jargon used; $\kappa = 0.554$), use of teach back method (yes or no; $\kappa = 1.00$), confirmation of patients' understanding (yes or no; $\kappa = 1.00$), and summarizing the patient's narrative (yes or no; $\kappa = 1.00$). For the categories teach back and summarizing the patient's narrative, separate clauses as a unit of analysis were inappropriate. For instance, if the physiotherapist stated *"I want to be sure I explained everything clearly, so can you explain it back to me, so I can be sure I did?"*, a separate clause did not contain any relevant information. However, the clauses taken together were relevant. Therefore, in some cases we deviated from the coding unit. Perfect inter-coder reliability was achieved for categories that appeared to be almost absent in the data and therefore meaningless. For more detailed information on the coding procedure, see Appendix 2.

2.3.4. Analysis of audio recordings of physiotherapy consultations

Descriptive statistics were used to describe characteristics of participating physiotherapists and patients.

To assess the frequency of use of communication techniques in physiotherapy, we calculated consultation percentages including 95% confidence intervals of consultations during which the communication technique was used. Additionally, the number of clauses per communication technique were counted for all 50 consultations.

We applied mixed effects logistic regression analyses to assess to what extent physiotherapists adjust their communication for patients with lower educational level. As physiotherapists treated multiple patients, and during each session, multiple clauses were obtained per patient, data clustering was supposed. Therefore, mixed effects logistic regression models were used to analyse the association between the use of communication techniques (dependent variable) and educational level (independent variable). Odds ratios (ORs) were obtained for unadjusted models, as well as a model adjusted for age (physiotherapists and patients), sex (physiotherapists and patients), whether it was the first visit to the current physiotherapist, and whether it was the first visit due to the current complaint.

In line with research where limited HL is correlated with the lowest and low level of education [51], lower education ($n = 16$) included no education, primary school, and lower secondary school. High education ($n = 34$) included upper secondary school, higher professional education, and university.

P values of < 0.05 were considered significant. The tests were performed using SPSS statistics, version 25 and mixed effects logistic regression models were performed using the LME4 package in R version 4.1.2.

3. Results

3.1. PHASE 1: focus group interviews

3.1.1. Characteristics of the participants

Between May 2019 and September 2019, two focus group interviews were conducted, both of which lasted 90 minutes. The expert focus group ($n = 5$) consisted of 2 male and 3 female participants, including a practicing physiotherapist, a general practitioner, an employee of the Public Health Service, and two physiotherapists/ researchers in the field of communication. The limited HL group ($n = 5$) consisted of 3 male and 2 female participants.

3.1.2. Results of the focus group interviews

Four categories of communication elements in physiotherapist – patient interaction for patients with limited HL were identified: Recognition of limited HL, Anxiety, Professional-patient relationship, and Communication recommendations (see Fig. 1).

3.1.2.1. Recognition of limited health literacy. Both groups indicated that health care professionals often do not recognize limited HL in patients, but categorize their patients based on a general impression instead of measuring HL. The expert group mentioned that the available tools for screening health literacy are hardly used. Both groups also mentioned that due to patients' strong ability to conceal their limited HL, recognizing limited HL is challenging. Patients with limited HL frequently use excuses to avoid exposure to situations in which reading and writing are required. Healthcare professionals should learn to recognize these excuses.

Categories	Codes	Low Literate group	Expert group	Quotes from Expert group (EG) or Low literate group (LG)
Limited health literacy recognition	Concealing low literacy	√	√	*"for 45 years I hid that I can't read or write at all" (LG)*
	Use of excuses	√	√	*"when I have to fill in a form, I immediately think of an excuse to leave" (LG)*
	Use of tricks	√	√	*"I forgot my reading glasses" (LG)*
	Recognition by gut feeling		√	*"it just didn't feel good, but because of unfamiliarity with the concept, I just ignored that feeling" (EG)*
	Limited knowledge of health literacy		√	*'increasing knowledge is necessary to recognize the patients' (EG)*
	Limited tools for screening health literacy		√	*"there are some screening tools but they are primarily used for research"(EG)*
	Living environment		√	*"some general indicators for recognizing limited HL are: what neighbourhood they live in, educational level and type of job" (EG)*
	Education level		√	
	Work		√	
Anxiety	Response from people/ healthcare professionals	√		*"you're so scared that people will find out you can't read and write" (LG)*
	Being unmasked	√		*"I always blindly signed everything without knowing what I was signing for, afraid of being unmasked" (LG)*
	Complete questionnaires	√		*"just seeing a questionnaire makes me panic so much" (LG)*
	Direction signs in hospitals or buildings	√		*"if you ask directions you get the answer that you can read it on the signs" (LG)*
	Finding the way to healthcare professionals	√		*"when you have an appointment, somewhere, for the first time, you are so afraid whether you will find it and whether you have understood the digital time correctly"(LG)*
	Understanding appointment time (digital clock)	√		
Relationship	Trust	√	√	*"if someone asks directly if you can read at the first meeting, we are shocked and will never tell. First you have to build a relationship of trust" (LG)*
	Time investment	√	√	
	Attitude	√	√	*"as a healthcare professional you must have an open and friendly attitude, like: I see you and I hear you" (EG)*
	Listening	√	√	*"because she was so calm and listened to me, I dared to tell her about my low literacy" (LG)*
	Calmness	√		
Communication Recommendations	Use simple words	√	√	*"if doctors start talking in doctor's language, stop it, just use simple words" (LG)*
	Explain words or medical jargon	√	√	*"when they start using Latin words I quit, unless they explain" (LG)*
	Use the same words as your patient		√	*"connect your communication to the patient's level by using the same words' (EG)*
	Be concrete	√	√	*"when we have to listen to the body, we don't know what to do, the body doesn't speak, does is?" (LG)*
	Ask Me 3		√	*"what is my main problem, what do I need to do and why is it important for me to do this?" (EG)*
	Teach-back	√	√	*"retelling the message is nice to do because then you know you can do it at home too" (LG)*
	Summarize patient's narratives		√	*"by summarizing you clarify the patient's expectations" (EG)*
	Confirm patients' understanding		√	*"if we don't understand why we need to do an exercise, we will never do" (LG)*
	Use aiding tools like pictures and anatomical models	√	√	*"patients with limited health literacy have less knowledge of the body, pictures are certainly supportive, but do indicate where the picture is located in the body" (EG)*
	Use of questionnaires		√	*"a questionnaire is a nice conversation tool" (EG)*

Fig. 1. Overview of major themes and categories derived from the focus group interviews.

''I always took an empty pen with me, or I didn't have my reading glasses" (participant limited HL group 1,5)

3.2. Anxiety

The limited HL group indicated anxiety as their most prominent problem as they keep their low literacy secret due to feelings of shame. Fear of being exposed and the expected reaction of others puts them in a continuous state of vigilance in regular daily situations. A particularly difficult situation in this respect is a consultation with a doctor or physiotherapist, in which coping with their fear of having to read an instruction or complete a questionnaire causes a high state of anxiety. As a consequence, their main focus is on concluding the consultation as quickly as possible, even if they did not understand anything the doctor or physiotherapist said.

"Just seeing a questionnaire *makes me panic so much, I no longer hear what's being said by the physiotherapist". (participant limited HL group 3).*

Their inability to read street names or, for instance, direction signs in a hospital, also evokes anxiety and stress because it complicates finding their directions in a new environment and attending appointments on time.

"The day before an *appointment, I already practice the route just to make sure I'll find it the next day and arrive on time" (participant limited HL group 5)*

3.2.1. Professional-patient relationship

Both groups mentioned the professional-patient relationship as a relevant factor. Patients with limited HL may need extra encouragement to tell their story and to take an active role in their healthcare. In order to open up, the patient must be reassured and feel confident. This requires trust, equality, and time. Feeling relaxed and comfortable with the healthcare professional is a prerequisite for asking questions if they do not understand what was said.

"Because she was kind and very calm and listened to me, I dared tell her that I have difficulty in reading and *writing". (participant limited HL group 4)*

3.2.2. Communication recommendations

Regarding communication with limited HL individuals, both groups recommended the teach-back method to check patient understanding by asking them to explain what they had learned in their own words.

The limited HL group indicated this approach as pleasant because it facilitates understanding of information, which in turn, enables them to adhere to advice or an exercise program. Both the limited HL group and the expert group indicated that the use of jargon might not necessarily be a problem, as long as the jargon is explained.

The importance of alignment with the existing level of knowledge and HL of the patient was emphasized. In order to make information comprehensible and clear, professionals should use unambiguous language, using short sentences and simple words. However, childish language should be avoided.

We have trouble reading *and writing, but that doesn't mean we're stupid! (participant limited HL group 3).*

Metaphors as well as the use of pictures and anatomical models were also considered helpful. During explanations, experts stressed the importance of including words that patients are familiar with and asking questions. The expert group recommended the use of the 'Ask Me 3' method. Ask Me 3 is a patient education program designed to improve communication between patients and healthcare providers.

3.3. PHASE 2: assessment of physiotherapy consultations

3.3.1. Characteristics of the participants

A total of 50 first consultations given by 22 physiotherapists (mean age 35 (SD=12.1); 9 female) were audio-recorded. Ten were specialized physiotherapists (9 Manual therapist and 1 Geriatric physiotherapist). Physiotherapists were located throughout the Netherlands. Their working experience ranged from 0.5 to 31 years (M=11.3, SD=11.0). Patients' demographic information is given in Table 1.

3.3.2. Physiotherapy consultations

The duration of consultations varied from 7 to 81 minutes. In total, 2670 relevant clauses were identified and coded. The number of relevant clauses per consultation varied from 4 to 184 (Median=46, IQR=31.5 – 68.5).

We coded four communication techniques based on the communication recommendations listed in Fig. 1: use of teach-back method, use of medical jargon, confirming patients' understanding, and summarizing patient's narrative. The percentages of the frequency of communication techniques applied in the 50 consultations were as follows: the teach-back method was used in 2% (95%CI: 0.4%−10.5%) of 50 consultations, medical jargon was used in 84% (95%CI: 71.5%−91.7%), patients' understanding was confirmed in 20% (95%CI: 11.2%−33.0%) and patient's narrative was summarized in 34% (95%CI: 22.4%−47.9%).

Of all 2670 clauses, the use of medical jargon without explanation was observed in 131 clauses (4.9%), compared to 24 (0.9%) including the use of jargon with explanation (Table 2). The teach-back method was used once (0.04%). In 11 (0.4%) clauses, patients were asked to confirm if they had understood the information, and the application of a summary was identified 26 times (0.9%).

For the mixed effects logistic regression analyses data were obtained from 22 physiotherapists and 50 patients. Based on comparison of the AIC coefficient, a random intercept was needed on patient level but not on physiotherapist level.

The mixed effects logistic regression models showed no association between educational level and the use of medical jargon (unadjusted OR:1.38 95%CI: 0.73–2.58) and summarizing the patients' narratives (unadjusted OR: 2.15 95%CI: 0.77–6.02). Adjusted analyses also gave similar but no significant result for the use of medical jargon (OR: 0.97 95%CI: 0.52–1.83). Adjusted analyses for summarizing the patient's narratives was not applicable due to low frequencies.

Mixed effects logistic regression models for analysing the association between educational level and the use of teach back method and confirmation of patients' understanding were not applicable due to low frequencies.

Table 1
Comparison of demographic information of patients.

	Lower Education (n = 16)	High Education (n = 34)
Age M (± SD)	53.7 (18.6)	44.2 (17.3)
Sex N (%)*	6 (37.5)	17 (50.0)
Male	10 (62.5)	17 (50.0)
Female		
Currently working N (%)	9 (56.3)	25 (73.5)
First visit to physiotherapist N (%)*	3 (18.8)	7 (20.6)
First visit to current physiotherapist N (%)*	12 (75.0)	23 (67.6)
First visit for current complaint N (%)*	8 (50)	14 (41.2)

* One missing value for sex and two missing values for first visit to physiotherapist, first visit to current physiotherapist, and first visit for current complaint for patients with low education. One missing value for first visit to physiotherapist for patients with high education.

Table 2
Frequencies of identified clauses in 50 physiotherapy consultations.

	Lower education (n = 1011) n (%)	High education (n = 1659) n (%)	Total (n = 2670) n (%)
Medical jargon with explanation	5 (0.5)	19 (1.1)	24 (0.9)
Medical jargon without explanation	45 (4.5)	86 (5.2)	131 (4.9)
Teach back method	0 (0.0)	1 (0.1)	1 (0.04)
Patients' understanding	4 (0.4)	7 (0.4)	11 (0.4)
Summary	6 (0.6)	20 (1.2)	26 (1.0)

Educational level as a proxy for Health Literacy. Lower education included no education, primary school, and lower secondary school. High education included upper secondary school and (applied) university.

4. Discussion and conclusion

4.1. Discussion

We conducted this mixed methods study to 1) to explore which communication elements are considered relevant for physiotherapist – patient interaction in patients with limited HL, and 2) to investigate the extent to which physiotherapists apply these recommended communication techniques in their consultations and whether they adjust their communication for patients with lower educational level, which is used as a proxy for limited HL.

Our studies resulted in two important findings. First, experts and patients agreed on a limited set of communication techniques necessary to tailor communication between physiotherapists and patients with limited HL. Second, recommended communication techniques were infrequently used; the teach-back method was only used in 2% of consultations, while medical jargon was used in 84% of consultations. No association was found between adjustment of communication by physiotherapists in either lower or high educational level of patients.

4.1.1. Comparison with existing literature

The use of teach-back method has been shown to improve knowledge and self-care abilities in patients with chronic diseases [52,53]. Several policy documents therefore recommend this method, for example the American Heart Association [54] and the American Diabetes Association [55]. The value of the teach-back method was also underlined in both our focus group interviews. Despite these recommendations our study shows that in physiotherapy practice, this method was not used by physiotherapists. This is in line with a recent nursing study [56]. This study concluded that nurses and allied healthcare professionals do not routinely use the teach-back method because of concerns about patient reactions. In another study [57], nurses and other health care providers were asked to indicate barriers to using the teach-back method. Those mentioned included: time, stress, and disinterested patients. But the respondents also mentioned feeling awkward using the teach-back method, the difficulty of using the method, and the need to be reminded to use it consistently [57].

Our study shows that physiotherapists hardly apply the communication recommendations for limited HL, and that they do not use different communication techniques when addressing patients with lower educational level. We suggest two possible explanations. First, physiotherapists may not recognize patients with lower educational level and/or limited HL as physicians tend to overestimate their patients' health literacy abilities [58,59]. This overestimation may prevent physiotherapists from adjusting their communication. For many patients, the stigma of limited HL may lead to compensatory behaviors that make the patient's literacy difficult to characterize [60–62]. Given the difficulty recognizing patients with limited HL is has been argued that health care providers should be advised to treat each patients using an universal precautions approach, assuming that all patients may have

difficulty comprehending health information.[17,63,64] The relationship between 'gestalt assessment' of HL and assessment instruments as reported in the literature is poor which justifies such an approach [65,66].

Second, although it is important for physiotherapists to adapt communication techniques in consultations with patients with limited HL [32,67], it is possible that they are unaware of the need, or lack the skills to adapt their communication technique for these patients [68]. According to the Royal Dutch Society for Physical Therapy communication skills are an important competence in physiotherapy practice [69]. Therefore, communication skills training, like active listening, clarifying and paraphrasing, is a core component in curricula across physiotherapy. Skills training is important because it can change physiotherapists' attitudes, confidence and practice in communication with their patients [70]. However, the ability of patients with limited HL to understand the information provided is critical but possibly receives relatively less attention in communication skills training [71]. The need to adapt physiotherapy communication techniques was further highlighted in the limited HL focus group, where anxiety was identified as an important issue. Anxiety can impact the performance and processing of communication [72]. Anxiety in patients with limited HL has also been reported in previous studies [4–7]. This is an important finding as anxiety is related to poorer treatment outcomes, as demonstrated in patients with chronic low back pain [73,74]. In addition, it has been reported that anxiety in patients with acute low back pain is an independent predictor of developing chronic low back pain at 12 weeks [75,76]. We therefore note that physiotherapists should be aware of anxiety in patients with limited HL.

4.1.2. Strengths and limitations

To our knowledge, our mixed methods study is the first to use both focus groups interviews and audio recordings of physiotherapy consultation to analyse communication recommendations and their actual use in naturally occurring consultations with patients with limited HL. Results from the focus group studies served as input for the development of the codebook to analyse physiotherapist consultations. Our insights into the communication elements considered relevant for physiotherapist – patient interaction, and how this is currently applied in daily practice form an important foundation for improving physiotherapy treatment in patients with low education levels and/ or limited HL.

One limitation is that we did not actually measure HL. We included individuals with low literacy as a proxy measure for limited HL In phase 1. However, as there is a relationship between educational level and the level of HL [77,78,22], in phase 2 we also included educational level as a proxy measure for limited HL. In order to increase the chance of including patients with limited HL, we selected physiotherapy practices in areas with a low SES. According to a 2003 Dutch report [18], physiotherapy use by patients with low SES is 20–50% higher compared to use in patients with higher SES. In phase 2 of our study, patients with low education were under-represented compared to patients with high education (n = 16 versus n = 34). A possible explanation for this is the major change in 2006 in Dutch health insurance system where the comprehensive basic health insurance, does not cover physiotherapy [19]. Therefore, if patients want physiotherapy to be covered by their health insurer, they need an additional more expensive insurance package. For obvious reasons this may be a barrier for patients with low SES. Another explanation is the limited participation of patients with low education in clinical research. In 2007, a systematic review conducted to determine barriers to participation in cancer-related trials showed that lower educational level was one of the most prominent barriers.[79].

A second limitation may be the limited number of participants in the two focus groups; as saturation may not have been reached. Increasing the number of focus groups may have generated other, additional communication suggestions [80]. Nevertheless, we expect that the combination of experts and individuals with limited HL revealed the important communication recommendations. Although we are not sure whether data saturation was reached [81].

A third limitation may be the moderate inter-coder reliability for categorization use of medical jargon ($\kappa = 0.554$). Therefore, this result should be interpreted with caution.

A fourth limitation may be the small sample size with low statistical power in phase 2. Because this study was the first to investigate the use of adapted language by physiotherapists in patients with lower education, an a- priori or even post-hoc power calculation was not feasible; clinically relevant differences are needed to perform such calculations [82]. Despite the large number of phrases (>2500), power could have been low as these phrases are based on data from only 50 patients. [83].

4.2. Conclusion

Our study shows that although there is a need for adjusted communication for patients with limited HL, physiotherapists do not apply recommended communication techniques. Furthermore, physiotherapists do not seem to adjust their communication to patients with lower educational level. However, given the small sample size of this study, further and larger studies are needed to substantiate this conclusion.

4.3. Practice implications

Our findings have practical implications for physiotherapy practice and education. Physiotherapists need to increase their knowledge about limited HL and the recognition of patients with limited HL. A screening instrument could help physiotherapists to identify patients with limited HL [59]. However, identification alone may not change the physiotherapist - patient communication. Therefore, health literacy education should include specific communication training that gives physiotherapists easy-to apply tools in their everyday practice.

Finally, we did not address why physiotherapists did not apply communication recommendations. Further work is needed to examine the reluctance by physiotherapists to apply these recommendations. In addition, further research should examine whether health literacy education or communication training for physiotherapists is associated with improved communication with patients with limited HL.

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CRediT authorship contribution statement

Ellis van der Scheer: Formal analysis, Investigation, Data curation, Writing – original draft, Visualization. **Geert Rutten:** Validation, Data curation, Writing – review & editing. **Inge Stortenbeker:** Data curation, Writing – review & editing. **Jos Borkent:** Software, formal analysis, Writing – review & editing. **Willemijn Klein Swormink**: Data curation, Writing – review & editing. **Enny Das**: Writing – review & editing. **Bart Staal:** Conceptualization, Methodology, Writing – review & editing, Supervision, Funding acquisition. **Wim van Lankveld**: Conceptualization, Methodology, Writing – review & editing, Supervision, Project administration.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1. Interview guide

Subject	Question for participants in expert group
Introduction	Introduction and the purpose of the meeting including encouraging the participants to speak freely and to respond to each other.
Opening question	Imagine a conversation with a patient with limited HL; how did that conversation go?
Limited health literacy recognition	To what extend do you recognize a patient with limited health literacy? On what basis do you recognize a patient with limited health literacy?
Communication	*Showing video fragment of a physiotherapy consultation:* – What do you see? – What do you think the impact is on the patient? – What should you change? What is the difference between the conversation with a patient with limited HL or a patient with sufficient or excellent HL? What is the need of a patient in a conversation? In which phase of the consultation is the biggest pitfall? Which communication techniques do we know? From the literature there are some general recommendations on communication for low literate patients like: – the use of teach-back method – the use of short sentences – the avoidance of medical jargon – asking the patient's understanding – summarizing Do you have additions to this list? Do you think that your words can evoke anxiety or negative expectations in your patient? What kind of words. What about nocebic words? Do you use nocebic words?
Aiding tools	Do you make use of information material? What do you use? And how?

Subject	Questions for participants in limited HL group
Introduction	Introduction and the purpose of the meeting including encouraging the participants to speak freely and to respond to each other.
Opening question	Have you ever visited a PT or a GP and how did the conversation go? Do you remember the first time you went to the PT or GP? Did the PT or GP listen to your story? Did you understand the message of the PT or GP?
Limited health literacy recognition	From experts' point of view healthcare professionals often do not recognize patients having difficulty with reading or writing or understanding information. What do you think about this? Do you think that PTs or GPs need to know your educational level? How do you feel when a PT or GP asks about your educational level?
Communication	When do you think that a conversation is going well? What is your need in a conversation? What is necessary for you to understand a PT or GP? Is it important for you to understand the message of PT or GP? How important is shared decision making for you**?** Meaning the PT or GP work together with the patient to reach a decision about care. Do you think there is a difference between communication with people with higher or lower educational level? From the literature there are some general recommendations on communication for low literate patients like: – the use of teach-back method (this is a method to confirm patients understanding by asking the patient to explain in their own words what they have heard) – the use of short sentences – the avoidance of medical jargon – asking the patient's understanding – summarizing What do you think of this list? What do you think of specific words like medical condition or negative words (arthrosis, hernia). Which phrase do you prefer: 1. Excessive strain on your back is **bad** for your recovery 2. Excessive strain on your back is **not good** for your recovery
Aiding tools	Does your PT or GP use pictures or anatomical models? What do you prefer?

PT: physiotherapist, GP: general practitioner

Appendix 2. coding process

Development of coding criteria

Based on the results of the focus group interviews and the literature, we developed a codebook to analyse the physiotherapy consultations.[50] First, we developed criteria for relevant clause selection. Clauses were selected if relevant to answer the question to what extent physiotherapists apply recommended communication techniques in patients with limited HL. Coder 1 (ES) and coder 2 (GR) were trained by a researcher (IS) from the Centre of Language for Language Studies, Radboud University, Nijmegen, the Netherlands. Coders 1 & 2 first coded two audio recordings together to further define and specify the codebook and coding strategy. After this test-coding sessions coders 1 & 2 independently performed the same coding strategy: reading the transcription, identifying different consultation phases, underlining relevant clauses, and categorizing each clause.

Coding procedure

Judgmental expressions of the physiotherapist about the patients' situation were identified. These included expressions by the physiotherapist during physical examination, expressions related to (explaining) the diagnosis, or expressions about treatment policy or expected treatment outcomes.

After identifying relevant clauses, both coders categorized the clauses. The *use of jargon* was noted as including an explanation or without an explanation. Jargon was defined as communication in medical or physiotherapeutic language, i.e., not in standard language. The *use of teach back* was indicated as present or absent. The use of teach back was present if the physiotherapist asked the patient to explain in their own words what they had

learned. *Patients' understanding* referred to explicitly asking whether the patient had understood. And finally, *summary* was noted as present if the physiotherapist summarized, in more than one sentence, what the patient had said.

Reliability analysis

The Kappa was used for the inter-coder reliability for selection of clauses and for categorizing the clauses.

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