**Using the Theory of Planned Behaviour to understand Nurses' Intentions to Recognise and Support their Patients with low (digital) Health Literacy.**

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# Abstract

**Background.** In the Netherlands, every fourth person has low health literacy (HL), which has implications for their health. Due to ongoing digital developments in the healthcare sector, requiring patients to also have *digital* HL, these patients could experience further health inequalities in the future. Nurses could play a vital part in avoiding these inequalities by recognizing and supporting patients with low (digital) HL. However, little is known about nurses' practices regarding recognizing and supporting patients with low (digital) HL and most of the studies on this topic have not used a theoretical framework. As the Theory of Planned Behaviour (TPB) has been successfully applied to describe and predict nurses' health intentions on other topics, it was also used in this study. **Aim.** This study's aim was therefore to examine nurses' current practices and their attitudes, subjective norms, perceived behavioural control, and intentions regarding recognising and supporting patients with low (digital) HL and to investigate the impact of these factors in explaining nurses' intentions to recognise and support these patients. **Method.** Data was collected with an online survey in which 167 nurses participated. The data was analysed by looking at the constructs' frequencies and by conducting Spearman correlational analyses as well as multiple regression analyses. **Results.** Results showed that nurses currently do not recognise and support their patients with low (digital) HL much. Nurses' attitudes were predominantly positive. Nurses' attitudes and subjective norms were the strongest predictors of nurses' intentions. **Conclusion.** The results could guide the development of training modules for nurses to provide them with the skills they need to empower their patients with low (digital) HL. For future research, it is advised to investigate the intention-behaviour gap identified in this study and to use another theory or an extension of the TPB.

*Keywords*: health literacy, digital health literacy, e-health literacy, nursing practice, patient-provider communication

**Introduction**

In the Netherlands, 1 in 4 adults has low health literacy (Willems et al., 2022). Health literacy can be defined as "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" (Sørensen et al., 2012, p. 3). People with low health literacy are often faced with medication adherence problems, poor health, and post-surgical complications (Aaby et al., 2017; Berkman et al., 2011; DeWalt et al., 2004; Scarpato et al., 2016; Mahoney et al., 2018).

Recent digital developments show great potential for patients and the healthcare system (e.g., Iyawa et al., 2016; Mitchell & Kan, 2019). Digital innovations such as online support fora and social media, and health technologies such as Electronic Medical Records (EMR), patient portals, teleconsultations, and telemonitoring could improve patients' understanding of their condition and might improve self-management of their disease. However, these technologies are often designed without patients' input and their use requires digital health literacy (Van Velsen et al., 2013). Digital health literacy can be seen as the convergence between digital- and health literacy (Honeyman et al., 2020) and is defined as "the ability to seek, find, understand, and appraise health information from electronic sources and apply knowledge gained to addressing or solving a health problem" (Norman & Skinner, 2006). Since many patients do not possess these skills, the risk exists that technologies rather decrease than increase patients' insight in their disease and self-management, and health inequalities could develop (Kroezen et al., 2018; van der Vaart et al., 2013).

In avoiding the development of such inequalities due to low (digital) health literacy, nurses could play a vital role (Wilandika et al., 2023), as they are often the intermediates who help decipher health information from other professionals, including physicians so that

patients can better understand the information and make informed decisions (Wittenberg et al., 2018). To help decipher health information for patients with low (digital) health literacy, nurses need to know how to recognize these patients and how to support their needs. Especially in the hospital setting, where patients are often being treated within a short period and sent home for post-treatment (Borghans et al., 2008), nurses need to be able to recognize and support patients with low (digital) health literacy within a short time frame.

Overall, little is known about nurses' practices regarding recognizing and supporting patients with low (digital) health literacy. Nevertheless, some studies have highlighted that nurses know little about this topic, often do not know the health literacy skills of their patients, and tend to overestimate it (e.g., Dickens et al., 2013; Goggins et al., 2016). Next to this, some studies have shown that many nurses have negative attitudes towards interacting with patients with low health literacy (Rajah et al., 2017; Reisi et al., 2022; Sriyanah et al., 2021) but that a more positive attitude towards communicating with those patients would make them feel more confident in doing so (Chang et al., 2021). In addition, the experience of nurses in interacting with patients with low health literacy also seems to play a role, as more experienced nurses have fewer communication problems with patients with low health literacy (Wittenberg et al., 2018) and feel more confident in communicating with patients with low health literacy than less experienced nurses (Chang et al., 2021). Yet most of the conducted studies have not used a theoretical framework for investigating which factors explain nurses' intentions and current practices regarding recognizing and supporting patients with low health literacy, and even fewer studies have examined nurses' intentions and current practices regarding recognizing and supporting patients with low *digital* health literacy.

The Theory of Planned Behaviour (TPB) proposes that people's attitude, subjective norm, and perceived behavioural control predict their intention to engage in a certain behaviour, in this case, the intention to (put effort in) recognise and support patients with low

(digital) health literacy. This intention is further supposed to predict whether they actually engage in this behaviour (e.g., Ajzen, 1991). Applied to the context of this study, this means how nurses think about practices regarding recognizing and supporting patients with low (digital) health literacy (attitude), how they perceive their peers to think about these practices (subjective norm), and how capable they feel of carrying out these practices (perceived behavioural control) predict their intention to do so, and this intention predicts whether they actually engage in these practices. The TPB has been successfully applied to describe and predict nurses' health intentions on a wide range of topics, including patient safety (Javadi et al., 2013; Wakefield et al., 2010) and hand hygiene during the outbreak of Covid-19 (Sin & Rochelle, 2022). Nonetheless, the TPB framework has yet not been applied to the context of recognizing and supporting patients with low (digital) health literacy.

This study consisted of two main objectives. The first objective was to (1a) examine nurses' current practices and their attitudes, subjective norms, perceived behavioural control, and intentions regarding *recognizing* patients with low (digital) health literacy and (1b) investigate the impact of the TPB factors in explaining nurses' intentions to *recognize* patients with low (digital) health literacy. The second objective was to (2a) examine nurses' current practices and their attitudes, subjective norms, perceived behavioural control, and intentions regarding *supporting* patients with low (digital) health literacy and (2b) investigate the impact of the TPB factors in explaining nurses' intentions to *support* patients with low (digital) health literacy. In line with prior research on nurses' health intentions (and behaviour) using a TPB framework, it was hypothesized for both contexts that attitude, subjective norm, and perceived behavioural control would positively correlate with intention, and that intention and behaviour would positively correlate as well.

**Method**

**Design**

This study had a cross-sectional correlational design and was part of the Empower Nurses to Empower their Patients (ENEP) project, which is a collaboration between the University of Twente (The Netherlands), the Isala Hospital Zwolle (The Netherlands), and several other educational institutions. ENEP's main goal is to develop and evaluate a training for (future) nurses to recognize and support their patients with low (digital) health literacy. The Ethics Committee of the University of Twente approved this study (approval number: 231375).

**Participants and Procedure**

Participants consisted of nurses and student nurses employed at the Isala Hospital Zwolle in the Netherlands. The inclusion criteria required participants to be a working nurse or nursing student during their internship at the Isala hospital, to be able to read and to be fluent in the Dutch language. Participants were recruited via email which included information about the study (such as its aim, its data management, and the topics in the questionnaire), as well as a link to the survey, and was distributed by a department manager of the Isala hospital. By clicking on the link, the survey page opened, and participants read more about the study (and/or watched an infographic about it) and were asked for their (active, online) informed consent. In total, 188 nurses and student nurses started with the questionnaire of which 167 finished it. Given that 2062 nurses are employed at the Isala hospital who could have participated, and 188 of them started the survey, the response rate was 9.1%.

**Instrument**

The online questionnaire was designed with Qualtrics, a web-based software for survey creation. The questionnaire was designed based on 1) existing items of other studies

focusing on health literacy trainings (e.g., Allenbaugh et al., 2019; Kaper et al., 2019; Mackert et al., 2011) measuring nurses' attitude, confidence, and skills, and 2) an expert meeting consisting of researchers of the ENEP project and some nurses of the Isala hospital to further refine the questions. Based upon the results of this meeting, some questions were omitted, and some were added.

The questionnaire entailed two main themes: (1) recognizing low (digital) health literacy and (2) supporting low (digital) health literacy. Each theme was further divided into a non-digital and digital context. The TPB factors were assessed regarding each of these four themes, except for subjective norm and intention, which were assessed for digital and non-digital health literacy together.

### Demographic & Job-related Characteristics

Participants were asked about some demographic characteristics (age, gender, and educational level) as well as about some job-related characteristics (working experience in years, type of clinic that they are working in, type of department that they are working for and main function that they have). For the exact wording of all questions and answer categories see Table 1 (results section).

### Recognizing (Digital) Health Literacy

**Current Practice** regarding recognizing patients with low *health* literacy (HL) was measured with a single item, with a 4-point Likert scale (1 = rarely or never, 4 = (almost) always). The item was "How often in the past month have you asked patients if they have difficulty understanding written texts?". Nurses' current practice regarding recognizing their patients with low *digital* health literacy (DHL) was also measured with a single item "How many times in the last month have you asked patients if they have difficulty using digital tools (such as patient portal, video calls, apps, etc.)?" (1 = rarely or never, 4 = (almost) always).

### TPB Factors: Recognizing (Digital) Health Literacy

**Attitude** regarding recognizing patients with low HL was measured with a single item, with a 5-point Likert scale (1 = totally disagree, 5 = totally agree). The item was "I see it as my job to ask patients if they have difficulty understanding written texts.". Nurses' attitude regarding recognizing patients low in DHL was measured with four items, that could each be answered on a 5-point Likert scale (1 = totally disagree, 5 = totally agree). An example item is "I see it as my job to ask patients if they have difficulty using digital tools (such as patient portal, video calls, apps, etc.).". The scale showed good reliability in the current study ($\alpha$ = .75). The **Subjective Norm** regarding recognizing patients with low HL and DHL was assessed with a single item, with a 5-point Likert scale (1 = totally disagree, 5 = totally agree). This item was "My colleagues and supervisor(s) think it is important that I make an effort to recognize low (digital) health literacy in my patients.". **Perceived Behavioural Control** regarding recognizing patients with low HL was measured with a single item, that could each be answered on a 5-point Likert scale (1 = very difficult, 5 = very easy) and was "How easy or difficult do you find it to ask patients if they have difficulty understanding written texts?". Nurses' perceived behavioural control regarding recognizing patients with low DHL was also measured with a single item "How easy or difficult do you find it to ask patients if they have difficulty using digital tools (such as patient portal, video calls, apps, etc.)?" (1 = very difficult, 5 = very easy). **Intention** regarding recognizing patients with low HL and DHL was measured with a single item, with a 5-point Likert scale (1 = totally disagree, 5 = totally agree). This item was "In the coming month, I plan to pay extra attention to recognizing low (digital) health literacy in my patients.".

### Supporting (Digital) Health Literacy

**Current Practices** regarding supporting patients with low HL were measured with six items, that could each be answered on a 4-point Likert scale (1 = rarely or never, 4 =

(almost) always). An example item is "How many times in the past month did you consciously tailor your communication to your patient's health literacy?". The scale showed acceptable reliability in the current study ($\alpha$ = .66). Nurses' current practices regarding supporting patients with low DHL were measured with nine items, that could each be answered on a 4-point Likert scale (1 = rarely or never, 4 = (almost) always). An example item is "How often in the past month did you support patients to search for relevant and reliable health information on the internet?". The scale showed excellent reliability in the current study ($\alpha$ = .94).

### TPB Factors: Supporting (Digital) Health Literacy

**Attitude** regarding supporting patients low in HL was assessed with six items, that could each be answered on a 5-point Likert scale (1 = totally disagree, 5 = totally agree). An example item is "I see it as my job to adapt my communication to my patient's health literacy needs.". The scale showed good reliability in the current study ($\alpha$ = .79). Nurses' attitude regarding supporting patients low in DHL was assessed with four items, that could each be answered on a 5-point Likert scale (1 = totally disagree, 5 = totally agree). An example item is "I see it as my job to support patients in finding relevant and reliable health information on the internet.". The scale showed good reliability in the current study ($\alpha$ = .77). The **Subjective Norm** regarding supporting patients with low HL and DHL was assessed with a single item, with a 5-point Likert scale (1 = totally disagree, 5 = totally agree). This item was "My colleagues and supervisor(s) think it is important that I make an effort to support low (digital) health literacy in my patients". **Perceived Behavioural Control** regarding supporting patients with low HL was measured with six items, that could each be answered on a 5-point Likert scale (1 = very difficult, 5 = very easy). An example item is "How easy or difficult do you find it to adapt your communication to your patient's health literacy?". The scale showed good reliability in the current study ($\alpha$ = .74). Nurses' perceived behavioural

control regarding supporting patients with low DHL was measured with four items, that could each be answered on a 5-point Likert scale (1 = very difficult, 5 = very easy). An example item is "How easy or difficult do you find it to support patients to find relevant and reliable health information on the internet?". The scale showed good reliability in the current study ($\alpha$ = .78). **Intention** regarding supporting patients with low HL and DHL was assessed with a single item, with a 5-point Likert scale (1 = totally disagree, 5 = totally agree). This item was "In the coming month, I plan to pay extra attention to supporting low (digital) health literacy in my patients.".

**Data Analysis**

The software package IBM SPSS Statistics Version 29 was used for all analyses. Participants who did not fully finish the study (100% progress) were removed from the dataset, leaving 167 respondents for the analyses. New variables were computed for all the scales that represented the average score of each TPB factor. This was done for the domains of (1) recognizing HL, (2) recognizing DHL, (3) supporting HL, and (4) supporting DHL individually. Descriptive statistics of the independent and dependent variables as well as frequencies of the demographic variables were explored. The data was checked for normality and reliability analyses (Cronbach alpha) for the scales were conducted.

One-sided Spearman's correlational analyses were done to check which and to what extent variables significantly are associated with each other. For all TPB factors, positive associations with intention and behaviour were expected. A correlation coefficient below .30 would be considered a weak correlation, a value between .30 and .49 as moderate, and a value of .50 and higher as strong (Field, 2009), for all correlational analyses. A p-value of 0.05 or less was considered as an indicator of a significant association. Multiple regression analyses were done to check the predictive power of the total model for intention in all four domains.

## Results

**Demographic & Job-related Characteristics**

As can be seen in Table 1, most of the participants were female. About a third of them were between the ages of 20 to 29 years, whereas almost half of them were between 40 and 59 years old. Most of the respondents had a higher vocational education (Dutch: hoger beroepsonderwijs (HBO)) level and worked in a clinic/nursing department, mostly in the surgery department. Almost a third of them had a few months to five years of working experience, another third had between 11 and 25 years, and another between 26 and 40 years. More than a third of the respondents indicated to be a nurse, whereby another 23% indicated to be a director nurse and another 26% a specialised nurse.

**Table 1**

*Demographic and Job-related Characteristics of the Participants (N = 167)*

| Demographic Characteristics | *n (%)* | Job-related Characteristics | *n (%)* |
|---|---|---|---|
| What is your gender? | | How many years have you been working as a nurse? | |
| Man | 12 (7.2) | 0 – 5 years | 49 (29.3) |
| Woman | 155 (92.8) | 6 – 10 years | 22 (13.1) |
| Other/ non-binary | -- | 11 – 15 years | 13 (7.8) |
| What is your age? | | 16 – 20 years | 11 (6.6) |
| Younger than 20 years | 2 (1.2) | 21 – 25 years | 20 (12) |
| 20 – 29 years | 57 (34.1) | 26 – 30 years | 13 (7.8) |
| 30 – 39 years | 21 (12.6) | 31 – 35 years | 19 (11.4) |
| 40 – 49 years | 38 (22.8) | 36 – 40 years | 16 (9.6) |
| 50 – 59 years | 40 (24) | More than 40 years | 4 (2.4) |
| Older than 59 years | 9 (5.3) | Do you work in the Outpatient Clinic or Clinic? | |
| What is your educational level? | | Outpatient clinic | 20 (12) |
| MBO | 31 (18.6) | Clinic/ nursing department | 133 (80) |
| HBO | 115 (68.9) | Day care | 8 (4.6) |
| WO | 4 (2.3) | Other | 6 (3.4) |
| Inservice | 17 (10.2) | Which department do you work in? | |
| | | Surgery | 48 (28.7) |
| | | Neonatology | 15 (9.0) |
| | | Cardiology | 10 (6.0) |
| | | Intensive Care | 10 (6.0) |
| | | Other | 84 (50.3) |
| | | What is your function? | |
| | | Nurse ("Verpleegkundige") | 62 (37.1) |
| | | Director nurse ("Regie verpleegkundige") | 38 (22.8) |
| | | Specialist nurse (Specialistisch verpleegkundige") | 43 (25.7) |
| | | Student nurse ("Student verpleegkundige") | 4 (2.4) |
| | | Nursing specialist ("Verpleegkundig specialist") | 5 (3) |
| | | Nursing researcher ("Verpleegkundig | 2 (1.2) |
| | | Other | 13 (7.8) |

## Recognizing (Digital) Health Literacy

As can be seen in Table 2, most nurses reported that in the past month, they have never or only occasionally asked a patient about their HL or DHL. Asking about their digital literacy occurred more often than asking about their understanding of written health information.

**Table 2**

*Recognizing Health Literacy (HL) and Digital Health Literacy (DHL) in patients:*

*Frequencies (%), Mean Scores and Standard Deviations (SD) on nurses' past Behaviour (N =*

*167)*

| | Selden or never (1) | Sometimes (2) | Regularly (3) | (Almost) always (4) | Mean (SD) |
|---|---|---|---|---|---|
| HL - How many times in the past month … <br> … have you asked patients if they have difficulty understanding written texts? | 66% | 29% | 4% | 1% | 1.4 (0.6) |
| DHL - How many times in the past month … <br> … have you asked patients if they have difficulty using digital tools? | 46% | 36% | 11% | 4% | 1.7 (0.8) |

In Table 3, nurses' scores on the items that measure TPB variables are summarized. Most nurses reported that they intend to pay extra attention to recognising low (digital) HL in their patients in the future. Nurses had on average a somewhat positive attitude towards recognizing their patients with low HL and DHL. Most of them indicated that it is important to ask their patients about their understanding of written health information, to know their patients' (digital) HL level, to assess their patients' low (digital) HL by using a questionnaire, and to write down if a patient has low (digital) HL in the patient file. However, most nurses did not agree or disagree when asked whether they see it as their job to ask their patients if they have difficulty using digital tools. About a third of the nurses said that they think it is important to their supervisors and colleagues to make an effort to recognize patients low in (digital) HL, and another third said that they would not know. Most nurses thought that it is somewhat easy for them to ask their patients whether they have trouble understanding written health information and to ask their patients whether they have difficulty using digital tools.

**Table 3**

*Recognizing Health Literacy (HL) and Digital Health Literacy (DHL) in patients:*

*Frequencies (%), Mean Scores and Standard Deviations (SD) on nurses' Intention (INT),*

*Attitude (ATT), Subjective Norm (SN) and Perceived Behavioural Control (PBC) (N = 167)*

| | Totally disagree (1) | Disagree (2) | agree nor disagree (3) | Agree (4) | Totally agree (5) | Mean (SD) |
|---|---|---|---|---|---|---|
| INT (HL & DHL) - In the coming month, I plan … | | | | | | |
| … to pay extra attention to recognising low (d)HL in my patients. | 3% | 14% | 29% | 49% | 5% | 3.4 (0.9) |
| ATT (HL) - I see it as my job to … | | | | | | |
| … ask patients if they have difficulty understanding written texts. | 2% | 5% | 23% | 58% | 12% | 3.7 (0.8) |
| ATT (DHL) - I see it as my job to … | | | | | | |
| … ask patients if they have difficulty using digital tools (such as patient portal, video calls, apps etc). | 10% | 27% | 37% | 24% | 2% | 2.8 (1.0) |
| … use a questionnaire to measure patients' (d)HL. | 2% | 9% | 29% | 49% | 11% | 3.6 (0.9) |
| … know my patients' (d)HL level. | 2% | 6% | 17% | 53% | 21% | 3.8 (0.9) |
| … note in the patient record if patients have low (d)HL. | 2% | 5% | 21% | 57% | 16% | 3.8 (0.8) |
| Scale score (α =.75) | | | | | | 3.5 (0.7) |
| SN (HL & DHL) - My colleagues and supervisor(s) think … | | | | | | |
| … it is important that I make an effort to recognize low (d)HL in my patients. | 4% | 18% | 39% | 36% | 4% | 3.2 (0.9) |

| | Very difficult (1) | Difficult (2) | difficult nor easy (3) | Easy (4) | Very easy (5) | Mean (SD) |
|---|---|---|---|---|---|---|
| PBC (HL) - How easy or difficult do you find it to … | | | | | | |
| … ask patients if they have difficulty understanding written texts? | 1% | 20% | 33% | 41% | 5% | 3.3 (0.9) |
| PBC (DHL) - How easy or difficult do you find it to … | | | | | | |
| … ask patients if they have difficulty using digital tools (such as patient portal, video calls, apps, etc.)? | -- | 10% | 23% | 61% | 6% | 3.6 (0.7) |

### Bivariate & Multiple Regression Analyses: Recognizing (Digital) Health Literacy

In Table 4, bivariate correlations between the dependent and independent variables are displayed. All correlations were in the expected significance and the expected direction, except perceived behavioural control regarding recognizing low HL, which showed no association with current behaviour or intention. Interesting was that the correlations between intention and current behaviour were relatively low, and overall, associations were stronger with intention than with past behaviour, except for perceived behavioural control.

The results of the regression analysis that was carried out to investigate the predictive power of the model for intention regarding recognizing low HL (Table 5) showed that the model explained 28% of the variance in intention, and significantly predicted intention, $F$ (.66,2.09) = 20.60, $p$ = <.01. While attitude and subjective norm contributed significantly to the model, perceived behavioural control did not. The results of the regression analysis that was carried out to investigate the predictive power of the model for intention regarding recognizing low DHL showed that the model explained 32% of the variance in intention, and significantly predicted intention, $F$ (−.46,1.17) = 25.67, $p$ < .01. While attitude and subjective norm contributed significantly to the model, perceived behavioural control did not.

**Table 4**

*Recognizing Health Literacy (HL) and Digital Health Literacy (DHL) in patients: Spearman Correlations between nurses' past Behaviour, Intention (INT), Attitude (ATT), Subjective Norm (SN), Perceived Behavioural Control (PBC) (N = 167)*

| Variable | Correlations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. |
| 1. Behaviour (HL) | 1.00 | | | | | | | | |
| 2. Behaviour (DHL) | .28** | 1.00 | | | | | | | |
| 3. INT (HL & DHL) | .15* | .21** | 1.00 | | | | | | |
| 4. ATT (HL) | .32** | .25** | .33** | 1.00 | | | | | |
| 5. ATT (DHL) | .23** | .28** | .46** | .51** | 1.00 | | | | |
| 6. SN (HL & DHL) | .19** | .14* | .46** | .34** | .31** | 1.00 | | | |
| 7. PBC (HL) | .11 | .04 | −.03 | .21** | −.01 | −.01 | 1.00 | | |
| 8. PBC (DHL) | .09 | .33** | .15* | .24** | .17* | −.02 | .53** | 1.00 | |

*Note.* ** $p$ < .01, * $p$ < .05 (one-tailed). $N$ = 167.

**Table 5**

*Recognizing Health Literacy (HL) and Digital Health Literacy (DHL) in patients:*

*Multiple Regression Results for the Effect of the Model on Intention (N = 167)*

| Predictor | HL | | | | | DHL | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | B | 95% CI | β | t | p | B | 95% CI | β | t | p |
| Attitude | .30 | [.14,.45] | .27 | 3.78 | <.01 | .42 | [.24,.60] | .32 | 4.60 | <.01 |
| Subjective Norm (HL & DHL) | .37 | [.23,.51] | .37 | 5.17 | <.01 | .37 | [.23,.50] | .37 | 5.39 | <.01 |
| Perceived Behavioural Control | −.08 | [−.22,.06] | −.08 | −1.11 | .27 | .11 | [−.05,.27] | .09 | 1.38 | .17 |
| Total explained variance ($R^2$) | .28 | | | | | .32 | | | | |

*Note.* Dependent variable: Intention. CI = confidence interval for *B*. ** *p* < .01, * *p* < .05.

## Supporting (Digital) Health Literacy

As can be seen in Table 6, most nurses indicated that they at least sometimes adjusted their communication with patients with low HL (e.g., by using illustrations, using the teach-back method, or avoiding difficult language). Tailoring the communication and using simple language was most often conducted, whereas using illustrations or videos was the least often used. However, the majority of nurses did not or seldomly support their patients with using *digital* tools (e.g., by helping with finding relevant websites, using the patient portal, or health tools or devices).

**Table 6**

*Supporting Health Literacy (HL) and Digital Health Literacy (DHL) in patients: Frequencies*

*(%), Mean Scores and Standard Deviations (SD) on nurses' past Behaviour (N = 167)*

| | Selden or never (1) | Sometimes (2) | Regularly (3) | (Almost) always (4) | Mean (SD) |
|---|---|---|---|---|---|
| HL - How many times in the past month …<br>… did you use a video when providing information? | 45% | 33% | 20% | 2% | 1.8 (0.8) |
| … did you draw figures or show pictures during information provision? | 44% | 35% | 17% | 4% | 1.8 (0.9) |
| … did you help read and fill in forms (letters, questionnaires)? | 40% | 38% | 18% | 4% | 1.9 (0.8) |
| … did you use the teach-back method (asking patient to repeat information in own words)? | 14% | 49% | 27% | 10% | 2.3 (0.9) |
| … did you consciously tailor your communication to your patient's health literacy? | 5% | 24% | 46% | 25% | 2.9 (0.8) |
| … did you use clear, simple language (no medical terms)? | 1% | 9% | 57% | 33% | 3.2 (0.7) |
| Scale score (α =.66) | | | | | 2.3 (0.5) |
| | | | | | |
| DHL - How many times in the past month …<br>… did you support patients to find tools or apps that might be useful (e.g., mindfulness app, music, (wall) projectors, Virtual Reality)? | 74% | 20% | 5% | 1% | 1.3 (0.6) |
| … did you support patients in using video consultations? | 83% | 2% | 1% | 14% | 1.3 (0.7) |
| … did you support patients to search for relevant and reliable health information on the internet? | 67% | 21% | 11% | 2% | 1.5 (0.8) |
| …have you provided support in finding alternatives for patients who cannot/will not use digital resources? | 79% | 19% | 8% | 3% | 1.5 (0.8) |
| … did you support patients to use apps/devices that allow them to measure certain physical measurements from home or send those to the hospital (e.g., heart rate, blood pressure, saturation, lung function)? | 94% | 2% | 3% | 1% | 1.6 (1.0) |
| … did you support patients in using the patient portal? | 65% | 26% | 8% | 1% | 1.6 (0.8) |
| … did you support patients to use apps/tools that allow them to report how they are feeling from home (e.g., answer questions about tightness, pain, fatigue)? | 85% | 8% | 4% | 2% | 1.7 (0.9) |
| … did you support patients in using email contact? | 80% | 14% | 4% | 2% | 1.7 (0.8) |
| … did you support patients to use digital information tools (e.g., videos, animations, online leaflets)? | 47% | 34% | 17% | 3 | 2.0 (0.8) |
| Scale score (α =.94) | | | | | 1.5 (0.5) |

In Table 7, nurses' scores on the items that measure TPB variables are displayed. Almost half of the nurses indicated that they intend to support their patients with low (digital) HL in the future whereas another third said that they are not sure. Nurses had on average a positive attitude towards supporting their patients with low HL (e.g., using the teach-back method, drawing figures, showing pictures or videos for clarification) but were somewhat more hesitant about supporting their patients with low DHL (e.g., finding relevant health information on the internet, finding tools or apps that are useful to the patient). Almost half of the nurses said that they think it is important to their supervisors and colleagues to support patients low in (digital) HL and another third said that they would not know. Most of them

felt somewhat more capable of supporting patients with low HL (e.g., by using plain and simple language or the teach-back method, by drawing figures, or by showing pictures or videos for clarification) than supporting patients with low DHL (e.g., by finding relevant and reliable information on the internet or alternatives for those who cannot use digital resources).

**Table 7**

*Supporting Health Literacy (HL) and Digital Health Literacy (DHL) in patients: Frequencies*

*(%), Mean Scores and Standard Deviations (SD) on nurses' Intention (INT), Attitude (ATT),*

*Subjective Norm (SN) and Perceived Behavioural Control (PBC) (N = 167)*

| | *Totally disagree (1)* | *Disagree (2)* | *agree nor disagree (3)* | *Agree (4)* | *Totally agree (5)* | *Mean (SD)* |
|---|---|---|---|---|---|---|
| **INT (HL & DHL) - In the coming month, I plan …** | | | | | | |
| … to pay extra attention to supporting low (d)HL in my patients. | 2% | 12% | 37% | 46% | 4% | 3.4 (0.8) |
| **ATT (HL) - I see it as my job to …** | | | | | | |
| … help patients read and fill in forms (letters, questionnaires). | 2% | 14% | 41% | 31% | 13% | 3.4 (0.9) |
| … draw figures or show images during information provision. | 1% | 6% | 22% | 55% | 16% | 3.8 (0.8) |
| … use videos wherever possible when providing information. | 1% | 3% | 15% | 63% | 19% | 4.0 (0.7) |
| … apply the teach-back method to check whether the information has been understood. | -- | 1% | 9% | 62% | 28% | 4.2 (0.6) |
| … make my communication as simple as possible so that every patient always understands it. | 1% | 2% | 2% | 37% | 59% | 4.5 (0.7) |
| … adapt my communication to my patient's health literacy needs. | -- | 1% | 2% | 38% | 59% | 4.6 (0.6) |
| Scale score (α =.79) | | | | | | 4.1 (0.5) |
| **ATT (DHL) - I see it as my job to …** | | | | | | |
| … support patients to find tools or apps that can be useful (e.g., mindfulness app, music, (wall) projectors, Virtual Reality). | 7% | 22% | 42% | 26% | 3% | 3.0 (0.9) |
| … support patients in finding relevant and reliable health information on the internet. | 7% | 19% | 35% | 24% | 4% | 3.1 (1.0) |
| … support patients to find alternatives for patients who cannot use digital resources. | 4% | 12% | 33% | 44% | 7% | 3.4 (0.9) |
| … support patients in using digital resources (e.g., patient portal, video calls, apps). | 2% | 10% | 37% | 45% | 6% | 3.4 (0.8) |
| Scale score (α =.77) | | | | | | 3.2 (0.7) |
| **SN (HL & DHL) - My colleagues and supervisor(s) think …** | | | | | | |
| … it is important that I make an effort to support low (d)HL in my patients. | 1% | 16% | 37% | 43% | 4% | 3.3 (0.8) |

| | *Very difficult (1)* | *Difficult (2)* | *difficult nor easy (3)* | *Easy (4)* | *Very easy (5)* | *Mean (SD)* |
|---|---|---|---|---|---|---|
| **PBC (HL) - How easy or difficult do you find it to …** | | | | | | |
| … adapt your communication to your patient's health literacy? | -- | 2% | 26% | 61% | 11% | 3.3 (0.9) |
| … use clear, simple language (no medical terms)? | -- | 2% | 15% | 69% | 14% | 3.5 (0.8) |
| … show or draw pictures during conversations? | 1% | 9% | 29% | 55% | 6% | 3.6 (0.8) |
| … use videos when providing information? | 1% | 9% | 31% | 53% | 7% | 3.6 (0.8) |
| … use the teach-back method? | -- | 7% | 28% | 56% | 8% | 3.7 (0.7) |
| … help patients read and fill in forms (letters, questionnaires)? | 2% | 7% | 39% | 45% | 8% | 3.9 (0.6) |
| Scale score (α =.74) | | | | | | 3.7 (0.5) |
| **PBC (DHL) - How easy or difficult do you find it to …** | | | | | | |
| … support patients to find tools or apps that can be useful (e.g., mindfulness app, music, (wall) projectors, Virtual Reality)? | 1% | 31% | 41% | 26% | 1% | 3.0 (0.8) |
| … support patients to find alternatives for patients who cannot use digital resources? | 1% | 28% | 43% | 29% | 1% | 3.0 (0.8) |
| … support patients to find relevant and reliable information on the internet? | 1% | 18% | 38% | 39% | 4% | 3.3 (0.8) |
| … support patients in using digital tools (e.g., patient portal, video calls, apps)? | -- | 13% | 37% | 48% | 2% | 3.4 (0.7) |
| Scale score (α =.78) | | | | | | 3.2 (0.6) |

***Bivariate & Multiple Regression Analyses: Supporting (Digital) Health Literacy***

In Table 8, bivariate correlations between the dependent and independent variables are displayed. All correlations were in the expected significance and the expected direction, except for subjective norm, which showed no association with behaviour regarding supporting low HL, perceived behavioural control regarding supporting low HL, which showed no association with intention, and intention, which showed no association with behaviour regarding supporting low HL. Similarly, as for the domain of recognizing low (digital) HL, the correlation between intention and current behaviour regarding supporting low DHL was relatively low, and overall, associations with intention were stronger than with current behaviour, except for perceived behavioural control.

The results of the regression analysis that was carried out to investigate the predictive power of the model for intention regarding supporting low HL (Table 9) showed that the model explained 34% of the variance in intention, and significantly predicted intention, $F$ $(-.84,1.16) = 27.85$, $p < .01$. While attitude and subjective norm contributed significantly to the model, perceived behavioural control did not. The results of the regression analysis that was conducted to investigate the predictive power of the model for intention regarding supporting low DHL showed that the model explained 36% of the variance in intention, and significantly predicted intention, $F$ $(-.15,1.26) = 30.22$, $p < .01$. While attitude and subjective norm contributed significantly to the model, perceived behavioural control did not.

**Table 8**

*Supporting Health Literacy (HL) and Digital Health Literacy (DHL) in patients: Spearman*

*Correlations between nurses' past Behaviour, Intention (INT), Attitude (ATT), Subjective*

*Norm (SN), Perceived Behavioural Control (PBC) (N = 167)*

| Variable | Correlations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. |
| 1. Behaviour (HL) | 1.00 | | | | | | | | |
| 2. Behaviour (DHL) | .52** | 1.00 | | | | | | | |
| 3. INT (HL & DHL) | .13 | .28** | 1.00 | | | | | | |
| 4. ATT (HL) | .39** | .28** | .48** | 1.00 | | | | | |
| 5. ATT (DHL) | .21** | .37** | .47** | .45** | 1.00 | | | | |
| 6. SN (HL & DHL) | .13 | .21** | .45** | .28** | .21** | 1.00 | | | |
| 7. PBC (HL) | .38** | .18** | .06 | .32** | .14* | .06 | 1.00 | | |
| 8. PBC (DHL) | .24** | .23** | .17* | .19** | .28** | .06 | .37** | 1.00 | |

*Note.* ** $p < .01$, * $p < .05$ (one-tailed). $N = 167$.

**Table 9**

*Supporting Health Literacy (HL) and Digital Health Literacy (DHL) in patients:*

*Multiple Regression Results for the Effect of the Model on Intention (N = 167)*

| Predictor | HL | | | | | DHL | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | B | 95% CI | β | t | p | B | 95% CI | β | t | p |
| Attitude | .63 | [.41,.86] | .39 | 5.52 | <.01 | .43 | [.28,.59] | .38 | 5.62 | <.01 |
| Subjective Norm (HL & DHL) | .35 | [.22,.49] | .35 | 5.13 | <.01 | .37 | [.24,.50] | .36 | 5.60 | <.01 |
| Perceived Behavioural Control | −.14 | [−.37,.09] | −.08 | −1.20 | .23 | .07 | [−.11,.24] | .05 | .75 | .46 |
| Total explained variance ($R^2$) | .34 | | | | | .36 | | | | |

*Note.* Dependent variable: Intention. CI = confidence interval for *B*. ** $p < .01$, * $p < .05$.

**Discussion**

Objectives 1a and 2a of this study entailed examining nurses' current practices and their attitudes, subjective norms, perceived behavioural control, and intentions regarding *recognizing* and *supporting* their patients with low (digital) HL. In our study, nurses reported that they currently rarely to never engage in practices that let them recognize and support their patients with low (digital) HL. This finding seems to be in line with studies by Nesari et al. (2019) and Cafiero (2013), in which the researchers investigated nurses' knowledge and experience regarding recognizing and supporting patients with low HL and found that nurses only rarely engage in practices that let them recognize and support their patients (use a HL screening tool on their patients, use written materials for education, or use audiotapes, videotapes or computer software for education). It seems as if nurses' practices in this regard have not changed much over the last ten years. A possible explanation for this could be that nurses do not have enough time to recognize and support these patients. In hospitals in particular, patients are treated within a short period and nurses are faced with increased time pressure (Shi et al., 2023), which could lead to them prioritising different tasks. Another explanation could be that nurses are not trained enough on how to recognize and support their patients with low (digital) HL yet. As of 2020, health literacy as a topic has not been structurally integrated into the basic curriculum of health professionals in the Netherlands (Sørensen et al., 2020). This means that many now practising nurses might have not learned about the urgency of this topic nor how to recognize and support patients with low (digital) HL in their training. It is therefore recommended to provide build-up trainings for current (and future) nurses that educate on how to recognize and support patients with low (digital) HL.

Although nurses in our study reported that they rarely to never engage in practices regarding recognizing and supporting their patients with low (digital) HL, they indicated to

have rather positive attitudes towards recognizing and supporting these patients. Our finding is in line with a study by Lewis et al. (2014) who investigated nurses' HL practices in a hospital setting in the United States and found positive attitudes in nurses regarding recognizing and supporting patients with low (digital) HL. However, research by Rajah et al. (2017), Reisi et al. (2022), and Sriyanah et al. (2021) who all examined nurses' knowledge and attitudes regarding recognizing and supporting patients with low HL (in Malaysia, Iran, and Indonesia) found overall negative attitudes in nurses regarding recognizing and supporting these patients. A possible explanation for the different findings regarding attitudes between our study and theirs is given by Rajah et al. (2017) who suggest that shortages of and increased time pressure for the medical staff in Malaysian hospitals could lead to negative attitudes in Malaysian nurses regarding recognizing and supporting their patients with low HL. According to the WHO, the Netherlands and the United States belong to the countries with the best and most advanced healthcare systems in the world and which possess enough resources to maintain this progress (World Health Organization, 2000). Thus, it could be that Dutch and North American nurses are more positive towards recognizing and supporting patients with low (digital) HL than nurses of other countries due to the advanced healthcare systems that they are working for.

      Objectives 1b and 2b of this study entailed investigating the impact of the TPB factors in explaining nurses' intentions to *recognize* and *support* their patients with low (digital) HL. To start with the results of the bivariate analyses of our study, the strength of the correlations between intention and current behaviour regarding recognizing and supporting patients with low (digital) HL was unexpectedly low, i.e., the correlation coefficients were below .30 ($r$ (167) = .15 to .28, $p$ < .01 to < .05). Other researchers who used the TPB to explain hand hygiene among nurses during Covid-19 found a similarly low correlation strength between intention and behaviour ($r$ (122) = .38, $p$ < .001) (Sin & Rochelle, 2022). A possible

explanation for the low correlation coefficients in our study could be perceived barriers by the nurses that act as a moderator on the relationship between their intention and their actual behaviour. In hospitals, barriers such as time constraints, lack of human resources, lack of knowledge in nurses about HL, and limited support from the organisation to implement health education that can improve HL patients were identified in earlier studies (Rajah et al., 2017; Sriyanah et al., 2021). Thus, it is possible that although nurses intend to recognize and support their patients with low (digital) HL, they are (currently) not doing so because they do not have enough time, personnel, knowledge, or support for it. It is advised for future research to investigate why nurses do not or only rarely recognize and support their patients with low (digital) HL although they intend to do so. It may be of interest to see if there are factors that moderate the relationship between intention and behaviour.

To continue with the results of the multiple regression analyses of our study, attitude and subjective norm were the strongest predictors of nurses' intentions to recognize and support patients with low (digital) HL. These findings are not in line with a study by Sharifirad et al. (2015) who investigated the impact of the TPB factors on nurses' intentions to use HL strategies in patient education (e.g., using simple and understandable language or media, or using multiple modalities) and found that perceived behavioural control was the first and strongest construct associated with nurses' intentions. A possible reason for the different findings by Sharifirad et al. (2015) could be the difference in the work experience of the nurses between their study and ours. About a third of the nurses in the study by Sharifirad et al. (2015) had between five to ten years of working experience, and 65% of them completed a patient education retraining course in the last year. In our study, almost a third of the nurses only had between a few months to five years of working experience and no formal education on the topic was provided before the questionnaire. According to Wittenberg et al. (2018) and Chang et al. (2021), more experienced nurses have fewer communication

problems with patients with low HL and have higher perceived behavioural control regarding communicating with these patients than less experienced nurses. Thus, it is possible that the different experience levels between the two samples could have affected the nurses' perceived behavioural control and thus led to different results.

The regression models based on the TPB factors in our study were able to predict nurses' intentions up to .36. Sharifirad et al. (2015) had similar results for their regression model on nurses' intentions (.24). According to Zikmund (2000) and Moore et al. (2013), such effect sizes (i.e., .30 to .50) can be considered weak. It could therefore be possible that the TPB factors alone are not sufficient in explaining nurses' intentions to recognize and support their patients with low (digital) HL. Future research is hence needed that uses other theories or an extension of the TPB to explain nurses' intentions regarding recognizing and supporting their patients with low (digital) HL.

**Strengths & Limitations**

By considering the strengths of this study, it can be said that it was based on a sufficiently big sample and that six out of the seven scales in this study had good reliability, i.e., higher than .70. Next to this, this study was, to our knowledge, the first one that investigated the impact of the TPB factors in explaining nurses' intentions regarding recognizing and supporting their patients with low (digital) HL, thus, contributing to the scarce body of research in this field.

For the limitations of this study, it should be noted that selection bias is possible in that nurses with a lower education level than the HBO may have been less likely to complete this study's questionnaire and are thus underrepresented. According to the Dutch central statistics office (Dutch: Centraal Bureau voor de Statistiek (CBS)), in 2022, most of the nurses in the Netherlands (57.4%) possessed a secondary vocational education (Dutch: middelbaar beroepsonderwijs (MBO)) and only 21.3% a higher vocational education (MBO)

(Centraal Bureau voor de Statistiek, 2023). In our study, 18.6% had an MBO level and 68.9% had an HBO level. Research showed that a higher education level can positively affect an individual's literacy and understanding (Asare et al., 2017) and increase the likelihood for them to participate in research (Baquet et al., 2006). It could therefore be possible that our results would differ for nurses with a lower educational level. We would like to emphasize once again the need for more research in this field. Although our research team did their best to recruit a representative sample, such under or overrepresentation is difficult to avoid when aiming for voluntary participation. Nevertheless, there are some ways in which future research can reduce selection bias, including stratified sampling, weighting and imputation (Keeble et al., 2015). However, according to Keeble et al. (2015), these methods also have their limitations and should be considered carefully.

Another possible limitation of this study comes from the assessment of some of the TPB factors. To be concrete, intention and subjective norm were measured with the same item for the digital and non-digital domains, which makes them not mutually exclusive and harder to draw conclusions from (Goodwin & Leech, 2006). Thus, it is advised for future research to measure digital and non-digital intention as well as subjective norms separately.

**Practical Implication**

The findings of this study suggest that nurses' attitudes and subjective norms are important factors to consider when aiming to change their intentions to recognize and support patients with low (digital) HL. These insights could be used as guidance for the creation of training modules for nurses to provide them with the skills they need to empower their patients with low (digital) HL in today's and tomorrow's healthcare system. Current trainings are often only focusing on improving nurses' attitudes, knowledge or skills (e.g., Kaper et al., 2019; Mackert et al., 2011; Yang et al., 2022). However, according to our findings, it seems important to integrate a social component as well. As a suggestion, testimonials from other

nurses encouraging paying extra attention to recognize and support patients with low (digital) HL could be provided in future trainings, increasing nurses' subjective norm and eventually their intention to recognize and support these patients.

**Conclusion**

This current paper aimed to examine nurses' current practices and their attitudes, subjective norms, perceived behavioural control, and intentions regarding recognizing and supporting their patients with low (digital) HL and to investigate the impact of the TPB factors in explaining nurses' intentions regarding recognizing and supporting these patients. Results showed that nurses currently do not or only rarely recognize and support their patients with low (digital) HL. Their attitudes were mostly positive, whereby their attitudes towards supporting patients with low HL were very positive. Most of the nurses perceived their peers to think that it is important to recognize and support low (digital) HL and felt mostly capable of doing so. Most of the nurses intended to pay extra attention to recognize and support their patients with low (digital) HL in the upcoming month. Results further showed that nurses' attitudes and subjective norms can be important constructs in explaining nurses' intentions to recognize and support patients with low (digital) HL. The insights given by this study could be used for the creation of training programs for nurses to equip them with the needed skills to empower their patients with low (digital) HL in the future.

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