



Original Research

The independent and moderator role of communicative health literacy on health, health behaviour and health care utilisation: a population based cross-sectional study



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ABSTRACT

Objectives: The aim of the present study is to investigate the association between communicative health literacy, health behaviour and health care utilisation, as well as the moderation effect of communicative health literacy on various health-related outcomes.

Study design: A total of 1205 Hungarian adults aged 18 years and older participated in this nationwide cross-sectional survey, which was part of the international Health Literacy Population Survey 2019–2021 (HLS₁₉).

Methods: Data collection was carried out at the end of 2020, using a multistage probability sample of the Hungarian adult population representative by age, sex, and settlement type. Multivariate logistic regression models were performed to examine whether communicative health literacy affects the main outcomes, followed by a moderation analysis.

Results: Better communicative health literacy was associated with increased odds of physical activity (OR = 2.68; 95% CI = 1.39–5.17), fruit and vegetable consumption (OR = 2.05; 95% CI = 1.13–3.70), and decreased odds of emergency (OR = 0.40; 95% CI = 0.21–0.76) and inpatient care use (OR = 0.36; 95% CI = 0.16–0.82) and limitations due to health problems (OR = 0.41; 95% CI = 0.21–0.80). Furthermore, we found a significant moderation effect between communicative health literacy and socio-demographic variables on self-perceived health status, smoking habits, use of inpatient care and limitations due to health problems.

Conclusions: The study confirmed that communicative health literacy has an independent main and moderating effect on health outcomes, health behaviours and health care utilisation. The results contribute to a better understanding of the complex pathways between health literacy and health.

1. Introduction

After health literacy (HL) was defined in the 1970s,¹ it soon became the focus of public health research as an important determinant of health.^{2,3} A growing body of literature suggests that patients with inadequate HL have limited ability to obtain health information, understand disease-related knowledge or develop self-management skills,⁴ lack accurate disease cognition and are prone to negative emotions, all of which affect the effectiveness of treatment and lead to adverse outcomes.^{2,3} Studies demonstrated an association between inadequate HL

and chronic diseases,^{5,6} health behaviour^{7–9} and mortality.^{10,11} However, the association is not obvious in some cases, such as with physical activity,^{12,13} diet¹⁴ and medication adherence.¹⁵ It is important to note that the results were strongly influenced by the domain of HL being studied, for example, healthcare use was more strongly correlated with digital HL than with general HL.^{13,15–18}

The distinctions between different health literacy domains^{2,3} led to the shift in HL research from a broad, general view toward recognizing that HL encompasses different levels or types of skills needed in real-life situations, allowing to design specific and targeted interventions

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through its domains. Communication between patients and providers plays a vital role in health care, not just regarding higher satisfaction,^{19,20} but also in the case of better outcomes.^{20–22} To manage chronic health problems on a daily basis, patients have to assess, understand, appraise, and use health information. But besides these individual skills, HL is connected with the accessibility of healthcare systems, the communication skills of providers, and the complexity of the health information will also influence it. HL results from the interaction between individuals and healthcare organizations and professionals.¹⁷ According to a recent definition of communicative health literacy (COM-HL) in healthcare, it means “patients’ communicative and social skills that enable them to actively engage in face-to-face encounters with healthcare professionals, to give and seek information, derive meaning from it, and apply this information in decision making and in co-producing their healthcare”.²³

COM-HL can help in the successful management of chronic conditions, but we have to keep in mind that the level of HL domains varies according to patients’ socio-demographic and disease characteristics.¹⁶ The association between HL and the social determinants of health is not widely studied or deeply understood, especially for the subdomains of HL. In previous studies, HL was concerned both as an independent and as a mediating health determinant, with the common finding is that there is a social gradient in HL, but the relationship between the different parameters is complex.²⁴ Furthermore, there is a lack of studies investigating the moderating role of socio-demographic factors in the relationship between HL and health outcomes.^{25,26} Despite the growing interest in health literacy, there remains a notable gap in the literature regarding its specific domains – particularly COM-HL –, but a recent study found that COM-HL accounted for most of the total variance in the construct of health literacy among people with diabetes,²⁷ which could highlight its importance. To the best of our knowledge, no studies have comprehensively examined the complex effects of COM-HL on health outcomes or health behaviours.

In this context, the aim of the present study is to investigate the association between COM-HL and health, health behaviour and health care utilisation. Understanding how the effect of socio-demographic variables (i.e. sex, education) may be moderated by COM-HL could provide important guidance for the development and improvement of messages targeted at populations with varying HL levels. So, we assessed the hypothesized moderator effects of COM-HL in the relationship between socio-demographic factors and health, health behaviour and health care utilisation.

2. Methods

2.1. Study design and sampling

A total of 1205 Hungarian adults aged 18 years and older participated in the cross-sectional nationwide survey which was part of the international Health Literacy Population Survey 2019–2021 (HLS₁₉).²⁸ Data collection was carried out at the end of 2020, using a multistage probability sample of the Hungarian adult population representative by age, sex, and settlement type. Computer-assisted telephone interviewing was used for data collection. More detailed information can be found in a previous publication.¹³ The study was approved by the Medical Research Council Scientific and Research Committee, Hungary (IV/10181-3/2020/EKU). Informed consent was obtained from all participants in accordance with the Declaration of Helsinki.

2.2. Data collection domains and tools

2.2.1. Measure of communicative health literacy

The 6 item version of the HLS₁₉-COM-P instrument was applied, which was developed within the HLS₁₉ survey for measuring COM-HL with physicians in health care services.²⁹ This contains the following items: “how easy would you say it is for you ... (1) to explain your health

concerns to your doctor?, (2) to get enough time in the consultation with your doctor?, (3) to express your personal views and preferences to your doctor?, (4) to ask your doctor questions in the consultation?, (5) to be involved in decisions about your health in dialogue with your doctor?, (6) to recall the information you get from your doctor?”. The answers of the items were measured on a four-point Likert scale from “very easy” (coded as 4) to “very difficult” (coded as 1). The final COM-HL score is calculated as the percentage (ranging from 0 to 100) of items with valid responses that were answered with “very easy” or “easy” (i.e., the items were implicitly dichotomized). A higher score indicates a higher level of COM-HL.²⁹ The Hungarian version of the instrument demonstrated high internal reliability (Cronbach’s alpha: 0.87, Spearman-Brown coefficient: 0.87) during the cross-cultural translation, adaptation and validation process. Construct validity was assessed using principal component and confirmatory factor analysis. The items belonged to one factor and 62.2 % of the total variation was explained by this factor on the basis of principal component analysis. The goodness of fit indices indicated that the one-factor structure of the six-item questionnaire provided a good fit to the data. A more detailed description of the assessment of the measurement properties of the Hungarian version has been published elsewhere.³⁰

2.2.2. Other covariates studied

The following socio-demographic variables were used: age, sex, childrearing status, education level, training in a health profession, self-perceived social status (SSS, a 10-point Likert scale with answers from “1” – lowest level to “10” – highest level in society). A three-item questionnaire was used to assess financial deprivation. These items addressed the difficulties encountered by respondents in (1) affording necessary medication, (2) undergoing medical examinations or treatments, and (3) paying all bills. Answers were recorded on a four-point Likert-scale from very difficult to very easy. In line with the international recommendation, a composite measure of the three items was calculated to provide an overall indication of deprivation. This score was calculated as the percentage of items answered as “very difficult” or “difficult”. The total score ranged from 0 [(very) difficult answers were not recorded] to 100 [only (very) difficult answers were recorded], where a higher score indicates greater financial deprivation. Two categories were created: deprived (score >50) and not-deprived (score ≤50).²⁸

Perceived social support was measured using the 3-item Oslo Social Support scale, where the final score ranges from 3 to 14: less than 8 points means poor, 9–11 points specifies moderate and more than 12 points indicates strong social support.³¹

2.3. The main outcomes of the study

2.3.1. Health behaviour

Health behaviour was assessed with four questions about the number of days in an average week when the respondent smoked any tobacco products, drank alcohol, ate fruits or vegetables and was physically active. The answers were measured on a nine-point Likert scale: never, less than weekly, once per week, two/three/four/five/six times a week and every day.

All these variables were dichotomized into favourable and unfavourable health behaviour perspectives. Favourable behaviours were defined as being a non-smoker, non-drinker (based on the response ‘never’), carry out daily physical activity and consumption of fruits and vegetables every day. Each of these favourable responses was analysed as an outcome category, while all other response options were grouped into the reference category.

2.3.2. Health status

Self-perceived health was measured by asking respondents to rate their health in general on a five-point Likert scale ranging from very good to very bad, and then the answers were collapsed into three

categories: good/very good, fair, bad/very bad. Having a chronic health problem (yes/no) and being limited by health problems (yes/no) were characterized with two separate questions of the European Health Interview Survey 2019.³¹

2.3.3. Health care utilisation

Health care utilisation variables included the number of episodes of emergency service use, the number of medical specialist visits, the number of admissions to inpatient care and the number of admissions to one day care services (e.g. surgical care without hospitalization), using the 2019 European Health Interview Survey³¹ methodology. All questions referred to the previous 12 months, except for the question on emergency services, for which the period was 24 months. Responses were recoded as “not used” and “used at least once”.

2.4. Statistical analyses

During the data-cleaning process, the sample was restricted to only those respondents with valid and non-missing data on COM-HL, demographic and socio-economic variables (excluding 140 participants), resulting in a final sample of 1065 participants for data analysis.

Descriptive statistics are presented for demographics, socio-economic variables, COM-HL, social support and self-perceived health, including means with standard deviations (SD), frequencies (n), and proportions (%).

As a baseline model, we performed multivariate logistic regression models to examine whether COM-HL affects the main outcomes (health status, health behaviour and health care utilisation), controlling for the confounding effect of the other covariates studied (sex, age, SSS, education, financial deprivation, childrearing, training in a health profession, social support, and self-perceived health). In the analysis, age, SSS and COM-HL (converted the percentage range to 0–1) were treated as continuous variables, the others as categorical. In the next step, moderation analyses using interaction terms between COM-HL and the socio-demographic variables were conducted in two steps. First, all possible combinations of age, sex, education, SSS, and COM-HL were included as interaction terms in the baseline models, using forward model selection (based on Akaike’s information criterion) to construct the full model. The stepwise variable selection technique was used to balance between automation and model interpretability, the model was built incrementally, starting with a simple framework (baseline model) and adding complexity (interactions) only when it was statistically necessary. Secondly, to obtain the most parsimonious model, non-significant ($p > 0.1$) interactions were removed from the full models resulting in the final evaluated models under investigation. Associations were quantified by odds ratios (OR) and corresponding 95% confidence intervals (95% CI), the goodness-of-fit was evaluated using Cragg-Uhler’s Pseudo- R^2 . Statistical analyses were performed with R software version 4.0.5 (R Development Core Team) using the packages “dplyr”, “stats” and “MASS”.

3. Results

3.1. Characteristics of the sample

The sex ratio was almost equal in the sample under investigation. More than a third of the respondents had completed secondary education, and 76.71% of them had not attended any health professional training. Almost three quarters of the respondents have children. Nearly 70% of the studied sample were not deprived. 53.33% of the respondents reported a moderate level of social support and more than half of the people described their own health as good or very good. The mean age of the respondents was 53.19 years and the mean SSS was 5.20 points. The estimated average COM-HL score was 87.80 (Table 1).

Table 1
Characteristics of the sample studied.

	n (%)	Mean (\pm SD)
Total	1065 (100%)	
Sex		
Male	500 (46.95%)	
Female	565 (53.05%)	
Education level		
Primary or less	151 (14.18%)	
Vocational	293 (27.51%)	
Secondary	393 (36.90%)	
University or higher	228 (21.41%)	
Health professional training		
Yes	248 (23.29%)	
No	817 (76.71%)	
Childrearing		
Yes	813 (76.34%)	
No	252 (23.66%)	
Financial status		
Deprived	349 (32.77%)	
Not deprived	716 (67.23%)	
Social support		
Poor	168 (15.77%)	
Moderate	568 (53.33%)	
Strong	329 (30.89%)	
Self-perceived health status		
Bad/very bad	95 (8.92%)	
Fair	418 (39.25%)	
Good/very good	552 (51.83%)	
Age (years)		53.19 (16.88)
Self-perceived social status		5.20 (1.52)
Communicative health literacy		87.80 (22.35)

SD: standard deviation.

3.2. The main effect of communicative health literacy

In the multivariate logistic regression models controlled for socio-demographic factors, better COM-HL was positively associated with the daily physical activity (OR = 2.68; 95% CI = 1.39–5.17). Respondents with higher COM-HL showed increased odds of daily fruit and vegetable consumption (OR = 2.05; 95% CI = 1.13–3.70) (Table 2).

Independently from the socio-demographic variables, increased COM-HL decreased the odds of limitation by health problems (OR = 0.41; 95% CI = 0.21–0.80). Better COM-HL was associated with reduced odds of emergency service use (OR = 0.40; 95% CI = 0.21–0.76) and inpatient care use (OR = 0.36; 95% CI = 0.16–0.82) (Table 3).

There was no significant connection between COM-HL and smoking habits, alcohol consumption, self-perceived health status, the existence of a chronic health problem, medical or surgical specialist services use and one day patient care use. The values of the pseudo- R^2 are varied between 3% (one day patient care use) and 27% (self-perceived health status) (Table 2, Table 3). The main effects of the other socio-demographic factors have shown the associations suggested by the literature, results can be found in Tables 2 and 3.

3.3. Moderation effect of communicative health literacy

The interaction of COM-HL with age was significant for self-perceived health status, indicating that the odds of good or very good health status in relation to age differed significantly by HL level, i.e. the odds of better health status increased with age among people with higher COM-HL. The positive association between higher SSS and the odds of good or very good self-perceived health status was greater for respondents with high COM-HL (Table 4).

COM-HL also moderated the effect of SSS on limitation by health problems, such that the reduced likelihood of limitation by health problems associated with better SSS was seen in those with higher COM-HL (Table 4).

COM-HL showed a significant moderating effect on the association between vocational and secondary education and inpatient care use,

Table 2

The main effects between communicative health literacy and health behaviour, estimated by multivariate logistic regression models.

	Being non-smoker OR (95% CI)	Being non-drinker OR (95% CI)	Daily physical activity OR (95% CI)	Daily fruit and vegetable consumption OR (95% CI)
Communicative health literacy	0.66 (0.35–1.27)	1.02 (0.55–1.87)	2.68 (1.39–5.17)	2.05 (1.13–3.70)
Female (ref.: male)	1.33 (1.00–1.77)	4.30 (3.26–5.68)	1.12 (0.85–1.47)	1.76 (1.35–2.29)
Age	1.04 (1.03–1.05)	1.00 (0.99–1.01)	1.00 (0.99–1.01)	1.02 (1.02–1.03)
Self-perceived social status	1.20 (1.08–1.33)	1.02 (0.92–1.12)	0.90 (0.81–0.99)	1.09 (0.99–1.20)
Education: vocational (ref.: primary or less)	1.19 (0.76–1.85)	1.01 (0.65–1.57)	1.53 (0.99–2.35)	1.65 (1.07–2.53)
Education: secondary (ref.: primary or less)	1.10 (0.71–1.71)	0.62 (0.41–0.95)	0.91 (0.59–1.40)	1.72 (1.13–2.61)
Education: University or higher (ref.: primary or less)	1.55 (0.93–2.59)	0.62 (0.38–1.00)	1.12 (0.69–1.82)	1.80 (1.12–2.88)
Not deprived financially (ref.: deprived)	1.15 (0.82–1.60)	0.88 (0.64–1.20)	0.83 (0.60–1.14)	0.99 (0.72–1.36)
Childrearing (ref.: no)	1.30 (0.91–1.87)	0.76 (0.54–1.07)	0.85 (0.60–1.21)	1.29 (0.92–1.81)
Trained in health care profession (ref.: yes)	1.24 (0.90–1.72)	0.82 (0.60–1.12)	0.69 (0.51–0.94)	0.85 (0.62–1.15)
Social support: moderate (ref.: poor)	1.09 (0.74–1.62)	0.90 (0.61–1.32)	1.33 (0.89–1.98)	1.13 (0.78–1.63)
Social support: strong (ref.: poor)	0.99 (0.64–1.53)	0.84 (0.55–1.28)	1.86 (1.20–2.86)	2.14 (1.42–3.22)
Health status: fair (ref.: bad)	0.93 (0.55–1.56)	0.32 (0.19–0.55)	1.25 (0.76–2.07)	1.72 (1.06–2.81)
Health status: good (ref.: bad)	1.39 (0.80–2.41)	0.38 (0.22–0.66)	1.18 (0.70–2.00)	2.06 (1.23–3.46)
Pseudo-R ²	0.114	0.196	0.059	0.134

OR (95 %CI): Adjusted odds ratios and the corresponding 95% confidence intervals, ref: reference category.

Significant differences are indicated in bold.

which means that there was a more pronounced odds reducing effect between higher education and inpatient care use among patients with high COM-HL (Table 4).

We found a three-way interaction effect between education, age and COM-HL on smoking status, which means that the probability of non-smoking was decreased among higher educated (secondary education or higher) older respondents with higher COM-HL (Table 4).

4. Discussion

Our investigation analysed the relationship between COM-HL and health status, health behaviour and health care utilisation, in the context of socio-demographic variables. The results indicated that individuals with higher COM-HL, independently from other socio-demographic factors, were more likely to be physically active daily and consume fruits and vegetables daily. As it was mentioned in the introduction, previous studies have mostly investigated the potential effect of general HL on health behaviour, health status and health care use, so the possibility to compare our results with those on COM-HL is limited. In several studies, favourable relationship was found between general HL, physical activity and diet in line with our results,^{7,32–35} a Japanese study found that higher levels of COM-HL were associated with favourable health-related lifestyle behaviours among health management specialists,³⁶ while high COM-HL was associated with exercise adherence in community-dwelling older adults.³⁷ In addition, a recent publication outlines the levels of COM-HL in Europe and identifies factors associated with it.³⁸ However, it does not examine the impact of low communicative health literacy on health status and lifestyle habits, nor the complex effect of socioeconomic variables and COM-HL on health.³⁸

Our research found no significant association between COM-HL and smoking or alcohol consumption. Part of the reason for these results may be that in the case of smoking and alcohol consumption, the effect of HL may not be as strong when it comes to addiction. This may highlight the importance of primary prevention in relation to substance use. Although the main effect of COM-HL on smoking has not been demonstrated, after added the interaction terms, the probability of smoking abstinence was decreased among older, more educated respondents with increased COM-HL. The result can be explained with the negative smoking statistics in the country. The prevalence of non-smoking among the 65+ age group does not differ by educational attainment, in other words, the protective effect of education disappears among older people.³⁹ In addition to this, while the general smoking prevalence shows a

decreasing trend, researchers found an increasing trend in the proportion of older smokers in Hungary between 2015 and 2018.⁴⁰ The results show that competencies related to education and COM-HL are not able to compensate for the negative health behaviours resulting from cognitive dissonance.

This study, however, expands upon existing knowledge by illustrating how COM-HL moderates the relationship between age, SSS and self-perceived health. The moderation analyses indicate that respondents with higher COM-HL, particularly those who are older and have a higher SSS, are more likely to determine their self-perceived health as good or very good. Concerning SSS, the moderating role of HL already demonstrated by other study.⁴¹ According to the analyses, COM-HL as a main effect reduced the likelihood of limitations by health problems and also moderated the effect between SSS and health limitations. Concerning the main effect, this finding is in line with the results of other studies.^{32,42} The moderation analyses suggest that respondents with higher SSS and high COM-HL rate were more likely to be not limited by health problems.

To date, several studies have examined the relationship between better HL and the less use of health care services with similar results as ours,^{32,43,44} but our study provides a first look on how COM-HL is related to health care utilisation. Our findings indicate that COM-HL is a crucial factor in the utilisation of inpatient and emergency services, but not in the use of medical or surgical specialist services and one day patient care. The results obtained can be explained by the specificities of the national health care system. One day patient care is mostly available for specific indications (e.g. eye surgery, urological surgery) and the patient has very little control over the process (i.e. one day care is not the patient's choice as a form of care). It is also possible that the correlation between the diseases included in the indications and COM-HL is weak. The use of medical or surgical specialist services can also be seen as somewhat specific, as this area is a mix of the private and public healthcare providers. A significant proportion of this type of care provided by the private systems, which are not financed by the general insurance scheme. In this case, therefore, socioeconomic status may be a stronger determinant than COM-HL. And this may be the reason why we have not seen a relationship between COM-HL and health care utilisation. The current study also showed that COM-HL moderates the effect between education and inpatient care use, for instance, the lower utilisation observed among those with higher levels of education is even more pronounced among those with higher levels of COM-HL. Increased COM-HL combined with higher levels of education strongly reduced the

Table 3

The main effects between communicative health literacy and the respondents' health status and health care use (at least once), estimated by multivariate logistic regression models.

	(Very) good self-perceived health status OR (95% CI)	Having chronic health problem OR (95% CI)	Limitation by health problems OR (95% CI)	Emergency services use OR (95% CI)	Medical specialist services use OR (95% CI)	Inpatient care use OR (95% CI)	One day patient care use OR (95% CI)
Communicative health literacy	1.44 (0.76–2.74)	0.95 (0.51–1.77)	0.41 (0.21–0.80)	0.40 (0.21–0.76)	0.83 (0.45–1.54)	0.36 (0.16–0.82)	0.76 (0.32–1.83)
Female (ref.: male)	0.96 (0.73–1.28)	1.09 (0.82–1.43)	1.24 (0.90–1.72)	0.91 (0.67–1.25)	1.21 (0.92–1.58)	0.82 (0.55–1.24)	0.73 (0.48–1.11)
Age	0.96 (0.95–0.97)	1.05 (1.04–1.06)	1.04 (1.03–1.05)	0.99 (0.98–1.00)	1.01 (1.00–1.02)	1.02 (1.01–1.03)	1.00 (0.99–1.01)
Self-perceived social status	1.17 (1.06–1.30)	0.92 (0.83–1.02)	0.98 (0.87–1.10)	1.11 (0.99–1.24)	0.95 (0.86–1.04)	1.02 (0.88–1.18)	1.00 (0.86–1.16)
Education: vocational (ref.: primary or less)	0.96 (0.61–1.52)	1.07 (0.68–1.68)	0.83 (0.51–1.35)	0.96 (0.59–1.54)	2.02 (1.31–3.12)	0.74 (0.41–1.33)	1.10 (0.58–2.08)
Education: secondary (ref.: primary or less)	1.08 (0.69–1.68)	1.21 (0.77–1.89)	0.69 (0.42–1.11)	0.81 (0.50–1.30)	2.56 (1.68–3.93)	0.67 (0.37–1.21)	0.89 (0.46–1.71)
Education: university or higher (ref.: primary or less)	1.76 (1.06–2.90)	1.15 (0.70–1.90)	0.65 (0.37–1.14)	0.72 (0.42–1.24)	3.67 (2.26–5.97)	0.56 (0.27–1.13)	1.15 (0.56–2.38)
Not deprived financially (ref.: deprived)	2.43 (1.77–3.34)	0.50 (0.36–0.69)	0.39 (0.27–0.55)	0.88 (0.61–1.26)	0.77 (0.55–1.06)	1.62 (0.97–2.69)	0.90 (0.55–1.47)
Childrearing (ref.: no)	0.86 (0.60–1.22)	1.01 (0.71–1.45)	1.23 (0.80–1.88)	0.95 (0.64–1.41)	0.93 (0.66–1.30)	1.05 (0.61–1.79)	1.12 (0.67–1.88)
Healthcare profession (ref.: yes)	0.83 (0.60–1.14)	0.94 (0.68–1.29)	0.99 (0.68–1.44)	0.87 (0.61–1.23)	0.91 (0.67–1.24)	0.55 (0.35–0.86)	0.98 (0.61–1.59)
Social support: moderate (ref.: poor)	1.31 (0.89–1.95)	0.75 (0.51–1.11)	0.54 (0.35–0.83)	1.42 (0.91–2.22)	1.35 (0.92–1.96)	0.89 (0.51–1.53)	0.95 (0.54–1.69)
Social support: strong (ref.: poor)	1.51 (0.97–2.33)	0.95 (0.62–1.46)	0.64 (0.40–1.02)	1.42 (0.86–2.32)	1.83 (1.20–2.79)	1.02 (0.56–1.86)	1.18 (0.63–2.20)
Health status: fair (ref.: bad)	–	–	–	0.32 (0.20–0.53)	0.44 (0.24–0.80)	0.19 (0.11–0.33)	0.41 (0.22–0.77)
Health status: good (ref.: bad)	–	–	–	0.23 (0.13–0.39)	0.22 (0.12–0.41)	0.13 (0.07–0.24)	0.37 (0.19–0.72)
Pseudo-R ²	0.267	0.240	0.215	0.070	0.120	0.144	0.031

-: Not analysed in the model.

OR (95%CI): Adjusted odds ratios and the corresponding 95% confidence intervals, ref: reference category.

Significant differences are indicated in bold.

Table 4

The interaction effects between communicative health literacy and socio-demographic factors on the respondents' self-perceived health, smoking status, limitation about health problems and inpatient care use, estimated by multivariate logistic regression models using forward model selection.

	(Very) good health status OR (95% CI)	Being non-smoker OR (95% CI)	Limitation by health problems OR (95% CI)	Inpatient care use OR (95% CI)
Age*COM-HL	1.05 (1.01–1.10)	–	–	–
Self-perceived social status*COM-HL	1.70 (1.10–2.64)	–	0.43 (0.27–0.68)	0.57 (0.31–1.06)
Vocational education*COM-HL	–	–	–	0.07 (0.01–0.84)
Secondary education*COM-HL	–	–	–	0.05 (0.00–0.63)
University or higher education*COM-HL	–	–	–	0.10 (0.01–1.56)
Primary education*Age*COM-HL	–	0.98 (0.93–1.02)	–	–
Vocational education*Age*COM-HL	–	0.96 (0.92–1.01)	–	–
Secondary education*Age*COM-HL	–	0.95 (0.91–0.99)	–	–
University or higher education*Age*COM-HL	–	0.93 (0.89–0.97)	–	–

No significant moderator effect was identified in the missing outcome variables.

-: the interaction term not significant an alpha level of 0.1 and not included into the model.

OR (95%CI): odds ratios and the corresponding 95% confidence intervals, controlled for the main effects of sex, age, communicative health literacy (COM-HL), age, self-perceived social status, education, financial deprivation, childrearing, trained in a health profession, social support, self-perceived health status.

use of inpatient care, while interestingly, no association was found between COM-HL and chronic diseases. One potential explanation may be that the ability of COM-HL to play a preventative role in the complex aetiology of chronic diseases is limited. However, patients with higher COM-HL and better education are presumed to be better able to manage their existing chronic conditions which leads to lower hospital admission rates.

Effective communication between patients and providers has a positive impact on patient-centred outcomes, such as patient satisfaction, quality of care, adherence to providers' recommendations, quality of

life, shorter hospital stay, and physical and mental health.²⁰ Communication is also a key aspect of patient-centred care,⁴⁵ such as shared-decision making, and these together can lead to the empowerment of patients. Health literacy also plays an important role in empowerment,² and health outcomes will depend on both HL and empowerment.^{46–48} Therefore, health communication must aim to empower patients, but in a way that leads to health-promoting decisions and behaviours.⁴⁹

In recent years, considerable number of frameworks, theories, components and techniques were developed for health promotion, but there

is still a lack of consensus^{17,18,24,50,51} on how can HL handled as an independent determinant of health regarding the design and implementation of health promotion programs. Moreover, the complex mechanism how HL, especially the special domains of it, can contribute to the gain of health, remains underdeveloped and largely untested. Our investigation contributes to the scientific knowledge to address this issue. A more accurate understanding of the pathways can help to develop more effective interventions to reduce health disparities among underserved and/or vulnerable populations with low COM-HL. For instance, promoting empowerment and self-care activities seem to be very important strategies together with improving COM-HL.²⁷

4.1. Strengths and limitations

The main strength of this investigation is that it based on a nationally representative random sample which provided a good basis for evaluating the study questions. In contrast to previous surveys, this is the first survey to use an internationally validated questionnaire which specifically designed to measure COM-HL. So, our study can provide a better understanding of the interrelationships between COM-HL and the studied outcomes.

However, there are some limitations that should be recognised. First, even though our survey used a validated questionnaire, recall and classification bias may exist because of the self-report nature of the data collection. In the critical evaluation of the results, it should also be mentioned that the statistical analysis did not consider other potential confounding factors (e.g. detailed history of diseases and injuries) that may have overestimated the observed associations between COM-HL and health care utilisation. The lack of a detailed history of chronic diseases, which was not included in the questionnaire, can be considered as another limitation. The relationship between COM-HL and the diseases would have been more robustly analysed if a detailed disease profile had been available. A further bias was introduced by the lack of data on the health services received by respondents, which may have nuanced the observed associations between health status and COM-HL. Although the questions used to measure diet, smoking, alcohol consumption and physical activity are not sufficiently detailed and can only be used as a rough estimate of health behaviour, but the results can play an important role in generating hypotheses. Lastly, because of the cross-sectional nature of the investigation, the observed associations cannot be interpreted as evidence of a causal relationship.

4.2. Conclusion

This study investigated the association between health status, health behaviour, health care utilisation and COM-HL and explored the role of moderating effects of COM-HL. The study confirmed the hypothesis that COM-HL is a relevant and independent factor of some domains of health, behaviour and health care utilisation. These areas appear to be mostly related to healthy lifestyles and chronic disease management. Our results also suggest some deeper information about how COM-HL moderates the effects of socio-demographic determinants of health, suggesting new relationships between COM-HL, and age, SSS and education that have not been modelled in previous studies. Our findings could help to design educational programs or tools to improve communication skills, especially in groups with low COM-HL.

An important consideration for future studies should be to identify other potential influencing factors and to determine which variables have mediating, moderating, and confounding effects on the causal relationship between COM-HL and health status, health behaviour and health care utilisation.

Author statements

Ethical approval

The study was approved by the Medical Research Council Scientific and Research Committee, Hungary (IV/10181-3/2020/EKU). In accordance with the Declaration of Helsinki, informed consent was obtained from all participants.

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Competing interests

The authors declare that they have no competing interests.

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