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Autoreferát dizertační práce



**UNIVERZITA KARLOVA  
1. lékařská fakulta**

Zdravotní gramotnost uživatelů návykových látek

Health literacy among drug users

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Dizertační práce bude nejméně pět pracovních dnů před konáním obhajoby zveřejněna k nahlížení veřejnosti v tištěné podobě na Oddělení pro vědeckou činnost a zahraniční styky Děkanátu 1. lékařské fakulty.

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# Abstrakt

**Východiska:** Jedinci s poruchami způsobenými užíváním návykových látek jsou náchylní k nízké zdravotní gramotnosti v důsledku rizikových faktorů souvisejících s jejich osobními a socioekonomickými charakteristikami. Současné znalosti jsou omezené, pokud jde o pochopení, zda nízká zdravotní gramotnost přispívá k nepříznivým zdravotním výsledkům a zda ovlivňuje chování související s užíváním návykových látek v této populaci.

**Design:** Průzkumná průřezová studie s využitím dotazníkového šetření.

**Cíle:** Zkoumat mnohorozměrnou zdravotní gramotnost a její koreláty u pacientů léčených v rezidenčních programech léčby závislosti a zkoumat zdravotní gramotnost jako prediktor subjektivních zdravotních ukazatelů a kvality života.

**Nastavení:** Rezidenční programy léčby závislosti (tj. detoxikační jednotky, ústavní péče, terapeutické komunity) v České republice.

**Participanti:** Byly analyzovány údaje 613 pacientů léčených v rezidenčních programech léčby závislosti pro poruchy duševní a poruchy chování vyvolané účinkem psychoaktivních látek (F10-F19, MKN-10).

**Metody měření:** Zdravotní gramotnost byla měřena pomocí české verze European Health Literacy Survey Questionnaire (HLS-EU-Q47). Byly shromážděny údaje o socioekonomických charakteristikách účastníků, subjektivních zdravotních ukazatelích a kvalitě života, chování souvisejícím s užíváním návykových látek a zkušenostech s léčbou. Jednoduchá lineární regrese byla použita k odhadu zdravotní gramotnosti a jejích korelátů. Hierarchická logistická regrese byla použita k identifikaci přímého vlivu zdravotní gramotnosti na subjektivní zdravotní ukazatele a kvalitu života po úpravě o relevantní proměnné.

**Výsledky:** Průměrné skóre bylo  $34.7 \pm 6.7$  z 50 v HLS-EU-Q47. Prevalence omezené/nízké zdravotní gramotnosti byla 40,5%. Zdravotní gramotnost byla spojena s formálním zdravotním vzděláváním, čistým příjmem domácnosti, podmínkami bydlení, zaměstnaneckým statutem a různými vzorci užívání alkoholu. Zdravotní gramotnost byla v adjustované analýze spojena se subjektivním celkovým zdravotním stavem, duševním zdravím a kvalitou života. Nebyl zjištěn žádný vztah

mezi zdravotní gramotností a dalšími proměnnými týkajícími se užívání návykových látek a zkušeností s léčbou.

**Závěry:** Mnoho pacientů léčených v rezidenčních programech léčby závislosti může mít potíže s orientací ve zdravotnickém systému a s řízením sebek péče k udržení si a zlepšení zdraví. Zvýšení zdravotní gramotnosti by mělo postupně zlepšit jejich celkový zdravotní stav, stav duševního zdraví a kvalitu života. Zdá se, že chování související s užíváním návykových látek nehraje významnou roli ve zdravotní gramotnosti této populace.

**Klíčová slova:** Zdravotní gramotnost – HLS-EU-Q47 – Poruchy duševní a poruchy chování způsobené užíváním psychoaktivních látek – Závislost na alkoholu – Závislost na návykových látkách – Rezidenční adiktologické služby

# Abstract

**Background:** Individuals with substance use disorders are likely to have low health literacy due to risk factors related to their personal and socioeconomic characteristics. Current knowledge is limited in understanding whether low health literacy contributes to adverse health outcomes and whether it influences the substance use behavior of this population.

**Design:** An exploratory cross-sectional study using a questionnaire survey.

**Aims:** To explore multidimensional health literacy and its correlates in patients treated in residential addiction treatment programs and investigate health literacy as a predictor of self-reported health indicators and quality of life.

**Setting:** Multiple residential addiction treatment programs (i.e., detoxification units, inpatient care, therapeutic communities) in the Czech Republic.

**Participants:** Data of 613 patients treated in residential addiction treatment programs for mental and behavioral disorders due to psychoactive substance use (F10-F19, ICD-10) were analyzed.

**Measurements:** Health literacy was measured using the Czech version of the European Health Literacy Survey Questionnaire (HLS-EU-Q47). Data on participants' socioeconomic characteristics, self-reported health indicators and quality of life, substance use behavior, and treatment experiences were collected. Simple linear regression was used to estimate health literacy and its correlates. Hierarchical logistic regression was used to investigate whether health literacy has a direct effect on self-reported health indicators and quality of life when adjusted for relevant covariates.

**Results:** The mean score was  $34.7 \pm 6.7$  out of 50 in HLS-EU-Q47. The prevalence of limited/low health literacy was 40.5%. Health literacy was associated with formal health education, household net income, housing conditions, employment status, and various patterns of alcohol use. Health literacy was associated with self-reported general health status, mental health status, and quality of life in the adjusted analysis. No relationship was found between health literacy and other variables related to substance use and treatment experiences.

**Conclusions:** Many patients treated in residential addiction treatment programs may have difficulties navigating the healthcare system and managing self-care to maintain and improve their health. Increasing health literacy should gradually improve their general health status, mental health status, and quality of life. Substance use behavior does not seem to play an important role in health literacy in this population.

**Keywords:** Health Literacy – HLS-EU-Q47 – Mental and Behavioral Disorders due to Psychoactive Substance Use – Alcohol Use Disorders – Substance Use Disorders – Residential Addiction Treatment Programs



# 1. Introduction

Health literacy is a multidimensional concept addressing the use of health information (Kickbusch, 2001; Nutbeam, 2000; Sørensen et al., 2012). Low health literacy has been associated with low socioeconomic status (Paasche-Orlow et al., 2005; Stormacq et al., 2019), poor health outcomes (Berkman et al., 2011), and risky health behavior, including substance use (Suka et al., 2015).

Individuals from disadvantaged, marginalized, and hard-to-reach populations, such as people with alcohol (AUDs) or other substance use disorders (SUDs), are likely to have low health literacy due to multiple risk factors (Bennett et al., 2009; Degan et al., 2020; Stormacq et al., 2020). Substance use has been linked to poor socioeconomic status (Hudson, 2005), poor health outcomes (Degenhardt et al., 2018), poor mental health (Torrens et al., 2015), lower life expectancy (Gavurová et al., 2020), deterioration in cognitive functioning (Green, 2006; Rock et al., 2014), poor access to healthcare (Palepu et al., 2013), poor access to specialized mental health services (Kagstrom et al., 2019), and risk of getting suboptimal healthcare (van Boekel et al., 2013) that all showed association with low health literacy (Berkman et al., 2011; Chesser et al., 2016; Federman et al., 2009; Mantell et al., 2020; Paasche-Orlow et al., 2005; Stormacq et al., 2019). Therefore, there is a potential risk that low health literacy may contribute to poor health outcomes in this population. Moreover, previous literature suggests that low health literacy could be a barrier to the effective management of mental illness and the utilization of mental health services (Clausen et al., 2016; Galletly et al., 2012).

Overall, little research has been done in the field of multidimensional health literacy in people treated for substance use disorders (Degan et al., 2020). One major gap in current knowledge is limited evidence of whether low health literacy contributes to poor health outcomes and plays an important role in the substance use behavior of this population.

# 2. Methods

## 2.1 Design and Aims

This exploratory cross-sectional study aimed to explore health literacy in patients treated in residential addiction treatment programs for mental and behavioral disorders due to psychoactive substance use (F10-F19, ICD-10).

### Primary objectives

- Examine health literacy in a general sample of patients treated in residential addiction treatment programs for mental and behavioral disorders due to psychoactive substance use using a multidimensional European Health Literacy Survey Questionnaire (HLS-EU-Q47; Sørensen et al., 2013).
- Estimate the relationship between health literacy and socioeconomic characteristics, self-reported health indicators and quality of life, substance use behaviors, and treatment experiences for the general sample.
- Investigate health literacy as a predictor of self-reported health indicators, specifically general health status, mental health status, physical condition, and quality of life, in the general sample.

Secondary objectives were set to offer extended analysis of HLS-EU-Q47 and explore health literacy in two homogeneous subsamples to achieve more precise statistical estimates (see Section 2.2 for the definition of subsamples).

## 2.2 Study Sample and Sampling

The study sample (general or total sample) comprised patients treated in residential addiction treatment programs for mental and behavioral disorders due to psychoactive substance use (F10-F19, ICD-10). Moreover, two mutually exclusive and exhaustive subsamples of patients diagnosed with AUDs (AUD subsample) and

patients diagnosed with SUDs (SUD subsample) were selected from the general sample for additional data exploration.

Sampling and data collection took place from May 2019 to December 2020 in the Czech Republic. Institutions of residential addiction treatment programs ( $n = 50$ ), i.e., detoxification units with dedicated detoxification beds offering medical detoxification, state-run psychiatric hospitals offering short- and medium-term inpatient care, and therapeutic communities offering socio-therapeutic care, served as a sampling frame for the recruitment of participants. In total, 21 (42%) institutions granted permission to carry out the recruitment and assessment of the patients. Participants were recruited on-site at the selected institutions using a self-selection method.

**Inclusion criteria.** Male or female, 15 years and older, fluent in Czech, and primary diagnosis of mental and behavioral disorders due to psychoactive substance use (F10-F19, ICD-10).

## 2.3 Measures

### 2.3.1 Health literacy

Health literacy was measured using the Czech translation of the European Health Literacy Survey Questionnaire (HLS-EU-Q47; Sørensen et al., 2013).

Participants were asked to assess the perceived difficulty of various health-related tasks on a 4-point Likert scale with the four response alternatives. Health-related tasks correspond to the four dimensions of information processing—accessing, understanding, appraising, and applying health information. Participant’s competencies were assessed within the three subdomains of health literacy—healthcare, disease prevention, and health promotion (Sørensen et al., 2013).

Health literacy is determined by index scores standardized on a scale of 0–50. Indices are calculated using the following formula:

$$Index = (mean - 1) \times (50/3)$$

where “*Index*” is the specific index calculated, *mean* is the mean of all partici-

pating items for each individual, 1 is the minimal possible value of the mean, 3 is the range of the mean, and 50 is the chosen maximum value of the new metric” (Pelikan et al., 2014, pp. 22). Score 0 represents the lowest health literacy, 50 is the highest health literacy (Pelikan et al., 2014; Sørensen et al., 2015).

Four levels of health literacy were defined as “inadequate” (0–25), “problematic” (> 25–33), “sufficient” (> 33–42), and “excellent” (> 42–50). A dichotomized scale define “limited health literacy” (combination of inadequate and problematic levels) and “adequate health literacy” (combination of sufficient and excellent levels; Pelikan et al., 2014; Sørensen et al., 2015).

### 2.3.2 Independent variables

Independent variables include demographic and socioeconomic characteristics, self-reported health indicators and quality of life, substance use behavior, and treatment experiences of participants.

*Demographic and socioeconomic variables* include gender, age in years, marital status, housing conditions, household size, educational attainment, employment status, formal health education (medical or other education in medical fields), household net income, and size of the place of residence. *Self-reported health indicators* of general health status, mental health status, physical condition, and quality of life were measured on a 5-point Likert scale using the single-item question. Participants were asked about psychiatric comorbidity. *Substance use behavior* include cigarette smoking, past-year frequency of alcohol use, heavy episodic drinking (HED), and intoxication, lifetime and past-year frequency of illicit drug use, age at the onset of alcohol use, alcohol intoxication, cannabis use, and other drug use, primary drug/addictive behavior, the preferred route of drug administration, needle sharing, and drug-related infectious diseases. Variables on substance use behavior were measured using single-item questions. *Treatment experiences* include participants’ experiences with various addiction treatment programs and the number of therapy drop-outs (Rolova et al., 2020; Rolová, 2020).

For a detailed description of the variables, see Rolová (2020).

## 2.4 Statistical Analysis

We performed descriptive statistics, correlation analyses, and regression analyses to analyze the data.

Descriptive statistics were calculated to describe the characteristics of the participants and outcomes from the health literacy assessment. Pearson's chi-square test, alternatively Fisher's exact test (for categorical variables), and Mann-Whitney U test (for continuous variables) were used to determine the statistical differences between the AUD and SUD subsamples. One-Way ANOVA was used to determine the statistical differences between the mean scores of AUD and SUD subsamples in health literacy.

Simple linear regression was used to estimate the relationship between general health literacy (dependent variable) and socioeconomic characteristics, self-reported health indicators, substance use behavior, and treatment experiences. The preliminary analysis included testing for linearity and homoscedasticity using scatter plots, multicollinearity using variance inflation factor (VIF), residue independence using Durbin-Watson statistic, and residue normality using normal probability plots. Hierarchical logistic regression was performed to investigate whether health literacy is an independent predictor of self-assessed health indicators when the model is adjusted for other relevant covariates. Independent variables entering the regression model were socioeconomic, health-related, and substance use-related factors selected on the basis of a priori theoretical knowledge. The likelihood-ratio test was used to compare the fit of the competing models.

The variables with the alpha level of .05 were considered as statistically significant outcomes. Data analysis was performed using the IBM SPSS Statistics 26.

## 2.5 Ethical Consideration

This study's research protocol was reviewed and approved by the Ethics Committee of the General University Hospital in Prague (Ref. 88/18 Grant GA UK 1. LF UK). The study was carried out with respect to the seventh revision of the World Medical Association Declaration of Helsinki – ethical principles for medical research involving human subjects (World Medical Association [WMA], 2013).

# 3. Results

## 3.1 Sample Characteristics

In total, 613 individuals participated in this study. Of these, 388 were individuals diagnosed with AUDs and 225 individuals diagnosed with SUDs. The majority were recruited in short-/medium-term inpatient care (63%); 19.7% were recruited in detoxification units and 17.3% in therapeutic communities.

Overall, the study sample consisted predominantly of males (74%). The mean age of participants was  $39.8 \pm 11.2$  years. Most participants were not married (58.2%), did have stable housing (82.5%), completed at least secondary education (ISCED 3) (76.8%), were unemployed (49.1%), had a household net income of less than CZK 35,000 (56.3%), were debt-free (61.2%), and lived in cities with 5,000–100,000 inhabitants (41.8%). Forty-three participants (7%) were healthcare professionals; most often, they were qualified as general nurses, enrolled nurses, or hospital attendants. Significant differences were observed in the demographic and socioeconomic characteristics between the AUD and SUD subsamples in terms of age, marital status, housing conditions, educational attainment, and debt situation.

In terms of substance use behavior, most participants were current smokers (75%), 56.4% of all participants reported past-year use of illicit drugs, mostly cannabis (43.2%), methamphetamine and other amphetamines (35.7%), and psychoactive medicines (28.4%). In the SUD subsample, the most frequently reported illicit drugs used in the past year were methamphetamine and other amphetamines (78.2%), cannabis (76.9%), and ecstasy (52%). A total of 28.9% of participants diagnosed with SUDs were daily users of methamphetamine and other amphetamines, 25.8% daily users of cannabis, and 11.1% daily users of psychoactive medicines.

## 3.2 Outcomes of Health Literacy Assessment

Overall, participants achieved a mean score of  $34.7 \pm 6.7$  out of 50 in HLS-EU-Q47. The prevalence of limited health literacy was 40.5% in the general sample; 32.5% of participants had problematic and 8% inadequate health literacy.

In terms of specific subscales of HLS-EU-Q47, the prevalence of limited health literacy was 25% in healthcare, 39.6% in disease prevention, and 54% in the health promotion domain. Regarding the information procession dimensions, the prevalence of limited health literacy was 40.6% for accessing, 26.7% for understanding, 50.1% for appraising, and 41.6% for applying health information for the general sample.

No differences were observed in health literacy between the AUD and SUD subsamples.

### 3.3 Health Literacy Correlates

Simple linear regression was used to estimate the relationship between health literacy and socioeconomic characteristics, self-reported health indicators and quality of life, substance use behavior, and treatment experiences of participants.

#### 3.3.1 Socioeconomic characteristics and health literacy

In the general sample, health literacy was significantly and positively associated with formal health education ( $b = 3.84$ , 95% *CI* [1.78, 5.89],  $p < .001$ ) and household net income ( $b = 0.16$ , 95% *CI* [0.01, 0.31],  $p = .037$ ). Negatively, health literacy was associated with homelessness ( $b = -1.93$ , 95% *CI* [-3.69, -0.17],  $p = .031$ ) and unemployment ( $b = -1.20$ , 95% *CI* [-2.27, -0.13],  $p = .028$ ). No significant relationship was found between general health literacy and gender, age, marital status, household size, level of education, length of unemployment, debt situation, and size of place of residence.

In the AUD subsample, health literacy was significantly and positively associated with formal health education ( $b = 3.35$ , 95% *CI* [0.93, 5.58],  $p = .007$ ) and negatively with homelessness ( $b = -3.19$ , 95% *CI* [-5.73, -0.64],  $p = .014$ ) and unemployment ( $b = -1.36$ , 95% *CI* [-2.71, -0.01],  $p = .048$ ).

In the SUD subsample, health literacy was significantly and positively associated only with formal health education ( $b = 4.95$ , 95% *CI* [1.03, 8.87],  $p = .014$ ).

### 3.3.2 Self-reported health indicators and quality of life and health literacy

In the general sample, health literacy was significantly and positively associated with health status ( $b = 1.26$ , 95% *CI* [0.77, 1.75],  $p < .001$ ), mental health status ( $b = 1.28$ , 95% *CI* [0.79, 1.77],  $p < .001$ ), physical condition ( $b = 1.31$ , 95% *CI* [0.83, 1.79],  $p < .001$ ), and quality of life ( $b = 1.35$ , 95% *CI* [0.84, 1.87],  $p < .001$ ); the better the self-reported health indicators, the higher the health literacy score. No significant relationship was found between health literacy and psychiatric comorbidity or specific types of mental disorders.

In the AUD subsample, health literacy was significantly and positively associated with mood disorders ( $b = 2.21$ , 95% *CI* [0.01, 4.41],  $p = .049$ ), health status ( $b = 1.21$ , 95% *CI* [0.61, 1.82],  $p < .001$ ), mental health status ( $b = 1.03$ , 95% *CI* [0.42, 1.64],  $p = .001$ ), physical condition ( $b = 1.40$ , 95% *CI* [0.79, 2.00],  $p < .001$ ), and quality of life ( $b = 1.39$ , 95% *CI* [0.75, 2.02],  $p < .001$ ).

In the SUD subsample, health literacy was significantly and positively associated with health status ( $b = 1.39$ , 95% *CI* [0.55, 2.23],  $p = .001$ ), mental health status ( $b = 1.76$ , 95% *CI* [0.93, 2.58],  $p < .001$ ), physical condition ( $b = 1.25$ , 95% *CI* [0.46, 2.05],  $p = .002$ ), and quality of life ( $b = 1.27$ , 95% *CI* [0.37, 2.16],  $p = .006$ ).

### 3.3.3 Substance use behavior and health literacy

In the general sample, health literacy was significantly and negatively associated with daily alcohol use ( $b = -1.26$ , 95% *CI* [-2.34, -0.18],  $p = .022$ ), daily HED ( $b = -1.37$ , 95% *CI* [-2.50, -0.23],  $p = .019$ ), and weekly alcohol intoxication ( $b = -1.14$ , 95% *CI* [-2.24, -0.03],  $p = .044$ ). No significant relationship was found between health literacy and other substance use-related factors.

In the AUD subsample, health literacy was significantly and negatively associated with past-year frequency of alcohol use ( $b = -0.87$ , 95% *CI* [-1.47, -0.28],  $p = .004$ ), frequency of HED ( $b = -0.86$ , 95% *CI* [-1.44, -0.28],  $p = .004$ ), and frequency of alcohol intoxication ( $b = -0.58$ , 95% *CI* [-1.02, -0.15],  $p = .009$ ). Health literacy was also negatively associated with daily alcohol use ( $b = -2.05$ , 95% *CI* [-3.39, -0.70],  $p = .003$ ), daily HED ( $b = -1.70$ , 95% *CI* [-3.06, -0.34],  $p = .015$ ), weekly alcohol intoxication ( $b = -1.40$ , 95% *CI* [-2.74, -0.05],  $p = .041$ ) and past-year gambling ( $b = -4.96$ ,



95% CI [-7.72, -2.20],  $p < .001$ ).

In the SUD subsample, no significant relationship was found between health literacy and substance use-related factors.

### **3.3.4 Treatment experiences and health literacy**

No statistically significant relationship was found between health literacy and the treatment-related factors for the general sample or the AUD and SUD subsamples.

## **3.4 Health Literacy as a Predictor of Self-Reported Health Indicators and Quality of Life**

Hierarchical logistic regression was used to determine if health literacy is an independent predictor of self-reported general health status, mental health status, physical condition, and quality of life when adjusted for relevant socioeconomic factors, health-related factors, and substance use-related factors.

### **3.4.1 Hierarchical model of self-reported general health status**

A four-staged hierarchical logistic model was performed for self-reported general health status (dependent variable). Independent predictors were gender, age, level of education, household net income (Model 1), past-year frequency of alcohol use, past-year any illicit drug use (Model 2), physical condition (Model 3), and health literacy (Model 4).

In *Model 1* ( $\chi^2(4) = 31.41$ ,  $p < .001$ ), age ( $OR = 0.97$ , 95% CI [0.96, 0.99],  $p = .001$ ) and household net income ( $OR = 1.08$ , 95% CI [1.04, 1.13],  $p = .001$ ) contributed significantly to the regression model. Gender and level of education did not have a significant predictive effect. In *Model 2* ( $\chi^2(6) = 38.79$ ,  $p < .001$ ), past-year frequency of alcohol use contributed significantly to the regression model ( $OR = 0.87$ , 95% CI [0.79, 0.97],  $p = .013$ ). Past-year any illicit drug use did not have a significant predictive effect. Age and household net income remained to be significant. In *Model 3* ( $\chi^2(7) = 215.68$ ,  $p < .001$ ), physical condition ( $OR = 3.37$ , 95% CI [2.78, 4.09],

$p < .001$ ) contributed significantly to the regression model. While age, household net income, and past-year frequency of alcohol use dropped out of significance, level of education start to have a predictive effect ( $OR = 1.22$ , 95%  $CI [1.04, 1.44]$ ,  $p = .016$ ). In *Model 4* ( $\chi^2(8) = 220.40$ ,  $p < .001$ ), health literacy contributed significantly to the regression model ( $OR = 1.03$ , 95%  $CI [1.00, 1.06]$ ,  $p = .030$ ). Level of education and physical condition remained to be significant.

In the final model, VIFs ranged from 1.04 to 1.60, indicating a low degree of multicollinearity between the independent variables.

### **3.4.2 Hierarchical model of self-reported mental health status**

A four-staged hierarchical logistic model was performed for self-reported mental health status (dependent variable). Independent predictors were gender, age, level of education, employment status (*Model 1*), past-year frequency of alcohol use, past-year any illicit drug use (*Model 2*), psychiatric comorbidity (*Model 3*), and health literacy (*Model 4*).

In *Model 1* ( $\chi^2(4) = 20.22$ ,  $p < .001$ ), gender ( $OR = 0.70$ , 95%  $CI [0.49, 0.98]$ ,  $p = .040$ ) and employment status ( $OR = 1.73$ , 95%  $CI [1.27, 2.35]$ ,  $p < .001$ ) contributed significantly to the regression model. Age and level of education did not have a significant predictive effect. In *Model 2* ( $\chi^2(6) = 30.22$ ,  $p < .001$ ), past-year frequency of alcohol use ( $OR = 0.90$ , 95%  $CI [0.81, 0.99]$ ,  $p = .035$ ) and past-year any illicit drug use ( $OR = 1.50$ , 95%  $CI [1.04, 2.15]$ ,  $p = .029$ ) contributed significantly to the regression model. Gender and employment status remained to be significant. In *Model 3* ( $\chi^2(7) = 43.95$ ,  $p < .001$ ), psychiatric comorbidity ( $OR = 2.07$ , 95%  $CI [1.42, 3.00]$ ,  $p < .001$ ) contributed significantly to the regression model. Gender, employment status, past-year frequency of alcohol use, and past-year any illicit drug use remained significant. In *Model 4* ( $\chi^2(8) = 67.61$ ,  $p < .001$ ), health literacy contributed significantly to the regression model ( $OR = 1.06$ , 95%  $CI [1.04, 1.09]$ ,  $p < .001$ ). Gender, employment status, past-year frequency of alcohol use, past-year any illicit drug use, and psychiatric comorbidity remained significant.

In the final model, VIFs ranged from 1.02 to 1.50, indicating a low degree of multicollinearity between the independent variables.

### 3.4.3 Hierarchical model of self-reported physical condition

A four-staged hierarchical logistic model was performed for self-reported physical condition (dependent variable). Independent predictors were gender, age, marital status, level of education, household net income (Model 1), past-year frequency of alcohol use, past-year any illicit drug use (Model 2), self-reported health status, self-reported mental health status (Model 3), and general health literacy (Model 4).

In *Model 1* ( $\chi^2(4) = 57.86, p < .001$ ), age ( $OR = 0.96, 95\% CI [0.95, 0.98], p < .001$ ) and household net income ( $OR = 1.12, 95\% CI [1.07, 1.17], p < .001$ ) contributed significantly to the regression model. Gender, marital status, and level of education did not have a significant predictive effect. In *Model 2* ( $\chi^2(7) = 60.57, p < .001$ ), past-year frequency of alcohol use nor past-year any illicit drug use did not have a significant predictive effect. Age and household net income remained to be significant. In *Model 3* ( $\chi^2(9) = 239.31, p < .001$ ), health status ( $OR = 2.86, 95\% CI [2.30, 3.56], p < .001$ ) and mental health status ( $OR = 1.37, 95\% CI [1.12, 2.66], p = .002$ ) contributed significantly to the regression model. Age and household net income remained significant. In *Model 4* ( $\chi^2(10) = 240.21, p < .001$ ), health literacy did not contribute significantly to the regression model. Age, household net income, health status, and mental health status remained significant.

In the final model, VIFs ranged from 1.07 to 1.67, indicating a low degree of multicollinearity between the independent variables.

### 3.4.4 Hierarchical model of self-reported quality of life

A four-staged hierarchical logistic model was performed for self-reported quality of life (dependent variable). Independent predictors were gender, age, marital status, level of education, household net income (Model 1), past-year frequency of alcohol use, past-year any illicit drug use (Model 2), mental health status, physical condition (Model 3), and general health literacy (Model 4).

In *Model 1* ( $\chi^2(5) = 29.43, p < .001$ ), household net income ( $OR = 1.10, 95\% CI [1.05, 1.15], p < .001$ ) contributed significantly to the regression model. Gender, age, marital status, and level of education did not have a significant predictive effect. In *Model 2* ( $\chi^2(7) = 64.57, p < .001$ ), past-year frequency of alcohol use ( $OR = 0.78, 95\% CI [0.70, 0.87], p < .001$ ) and past-year any illicit drug use ( $OR = 2.01,$

95% *CI* [1.37, 2.95],  $p < .001$ ) contributed significantly to the regression model. Household net income remained to be significant. In *Model 3* ( $\chi^2(9) = 225.75$ ,  $p < .001$ ), mental health status ( $OR = 2.05$ , 95% *CI* [1.69, 2.47],  $p < .001$ ) and physical condition ( $OR = 1.94$ , 95% *CI* [1.60, 2.34],  $p < .001$ ) contributed significantly to the regression model. Household net income, past-year frequency of alcohol use, and past-year illicit drug use remained to be significant. Marital status started to have a predictive effect ( $OR = 0.54$ , 95% *CI* [0.33, 0.87],  $p = .012$ ). In *Model 4* ( $\chi^2(10) = 231.23$ ,  $p < .001$ ), health literacy contributed significantly to the regression model ( $OR = 1.03$ , 95% *CI* [1.01, 1.06],  $p = .019$ ). Marital status, household net income, past-year frequency of alcohol use, past-year illicit drug use, mental health status, and physical condition remained to be significant.

In the final model, VIFs ranged from 1.07 to 1.68, indicating a low degree of multicollinearity between the independent variables.

## 4. Discussion

In this study, up to 40.5% of our study sample had low health literacy. In comparison, one previous study in Czech patients treated for AUDs reported the prevalence of low health literacy 46.9% (Rolová et al., 2018). One abroad study in Australian patients treated for SUDs found the prevalence of low health literacy as high as 87% (Degan et al., 2018). An extended analysis of specific subscales of HLS-EU-Q47 has shown that participants have gaps in health promotion and in appraising health information.

Compared to the reported results of the national population-based survey of health literacy (Kučera et al., 2016), our study population achieved overall better results in HLS-EU-Q47. We assume that increased medical attention and intensive contact with healthcare professionals during the residential addiction treatment, and increased motivation to change certain health-related habits could reflect higher health literacy in our study population. Future studies should explore the potential of various addiction treatment programs to increase health literacy in patients, as the long-term setting of these programs provides an excellent opportunity to promote health literacy in a large number of patients.

In spite of their different socioeconomic backgrounds, we have not found any differences in the health literacy between the AUD and SUD subsamples. One explanation could be that receiving addiction treatment contributes to an increase in health literacy to the extent that differences in the health-related skills of patients with different diagnoses and socioeconomic characteristics are eliminated.

In terms of demographic and socioeconomic factors, health literacy was associated with formal health education, household net income, housing conditions, and employment status in our study. Participants who reported no formal health education, lower household net income, were homeless, and unemployed scored lower in HLS-EU-Q47. Our findings are consistent with the results of previous population-based studies who suggest that financial deprivation and low income are some of the important predictors of low health literacy (Levin-Zamir et al., 2016; Sørensen et al., 2015). It has been suggested that it is likely because socioeconomically disadvantaged individuals do not have enough material resources to access health

information and make healthier choices, such as attending educational courses or purchasing health-related literature (Phelan et al., 2010; Stormacq et al., 2019).

Unlike previous studies (Levin-Zamir et al., 2016; Sørensen et al., 2015; Svendsen et al., 2020; von Wagner et al., 2007), we have not found a relationship between health literacy and age or level of education, two of the most important and consistent predictors of health literacy, but this is presumably because we had small numbers of older and university-educated people, which are the two groups of people in whom differences in health literacy are most pronounced.

Not surprisingly, healthcare professionals achieved consistently higher scores in all subscales of HLS-EU-Q47.

Our findings suggest that health literacy has a direct effect on self-reported general health status, mental health status, and quality of life, which is in line with previous studies in diverse populations (Degan et al., 2018; Jayasinghe et al., 2016; Lincoln et al., 2006; Sørensen et al., 2015; Toçi et al., 2015; van der Heide et al., 2013). Increasing health literacy should gradually improve general health status, mental health status, and quality of life in patients treated with addiction.

The association between health literacy and physical condition was significant only in the bivariate analysis but not after adjusting for other relevant factors. Because physical inactivity is one of the major risk factors of non-communicable diseases worldwide (Lee et al., 2012), the relationship between health literacy and physical condition is worthy of further examination.

In the case of the association between low health literacy and poor mental health status, we hypothesize that persistent stigmatizing and discriminatory attitudes towards people with mental health problems on the part of the Czech public (Winkler et al., 2015; Winkler et al., 2016) could be part of the problem. Perceived stigma and discrimination can contribute to reducing the willingness of people with mental illness to seek information about mental health problems, approach healthcare professionals, and access specialized health services in general (Corrigan et al., 2014). Consequently, a lack of information and skills to manage mental health problems could reflect in the health literacy of those with poor mental health.

Quality of life is strongly linked to health (Theofilou, 2013). One explanation of the association between low health literacy and poor quality of life could be that

individuals with impaired health also perceive their quality of life as low. One other explanation could be that those with low health literacy are self-aware of their own limits in health literacy as well as the barriers they have to overcome due to low health literacy skills, which could be physically and mentally exhausting enough to affect the quality of life of those affected.

In terms of substance use behavior and treatment experience, we found only a small number of those factors to be associated with health literacy in our study; those were mostly various patterns of alcohol use. We were not able to establish a relation between health literacy and patterns of illicit drug use or experiences of patients with addiction treatment. Therefore, other factors than health literacy are likely to play a role in the substance use behavior of our study population. In agreement with Wolf et al. (2007), those will likely be psychosocial factors, such as self-esteem, attitudes, positive expectancies, parental and peer attitudes and norms, social pressure, lifestyle factors, and environmental factors that are established predictors of the onset of substance use and established predictors of the onset of substance use and subsequent substance use disorders (Donovan, 2004; Tyas & Pederson, 1998).

Interestingly, in the subsample of patients diagnosed with AUDs, a higher frequency of various patterns of alcohol use was associated with lower health literacy scores. Our hypothesis is that this could point to alcohol-induced cognitive impairment in individuals who are regular or very heavy alcohol consumers. The association between cognitive functioning and health literacy was well documented in older people with age-related cognitive impairments (Chesser et al., 2016; Federman et al., 2009; Kobayashi et al., 2015). We assume that the association between alcohol-related cognitive deficits and health literacy may be explained similarly.

## 4.1 Limitations

There are limitations to this study that we acknowledge in this paragraph.

First, the cross-sectional design of this study does not allow to establish causality (Levin, 2006). Second, the self-report tool with a Likert-type scale was used to measure health literacy (HLS-EU-Q47). These kinds of questionnaires are known to be prone to response biases (Wetzel et al., 2016). In addition, one study has re-

cently suggested some psychometric shortcomings of the HLS-EU-Q47 (Finbråten, 2018). Third, the use of the non-probability sampling method limits the representativeness of the study sample and may have resulted in a biased sample (Kakinaki & Conner, 2010). Fourth, the characteristics of the study sample were measured by single-item questions, which may not fully represent the complexity of the given constructs. Last, health indicators and quality of life were measured by self-report; therefore, the participants' rating may not reflect their actual status of health.



# 5. Conclusions

In this thesis, we examined health literacy and its correlates in patients treated in residential addiction treatment programs for mental and behavioral disorders due to psychoactive substance use. Moreover, we investigated health literacy as an independent predictor of self-reported health indicators and quality of life.

In conclusion, a considerable number of patients with addiction may have difficulties with navigating the healthcare system and managing self-care to maintain and improve their health. It seems that substance use behavior and treatment experiences do not have significant effects on health literacy in this population.

Increasing their health literacy should gradually improve their general health status, mental health status, and quality of life. In order to achieve more significant effects, it may be necessary to focus on improving the socioeconomic determinants, reducing stigma and discrimination, and improving the overall well-being of patients with addiction.

Healthcare professionals in addiction treatment programs should take into account the health literacy of patients in treatment planning. Most basic recommendations include the use of clear and plain language in both oral and written communication to increase comprehensibility. It is also necessary to support patients in developing more advanced skills, such as decision-making, problem-solving, and critical thinking.

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# List of Publications

## 1. Publications *in extenso* related to this doctoral thesis

### a. Publications with IF

**Rolová, G.**, Gavurová, B., & Petruželka, B. (2021). Health literacy, self-perceived health, and substance use behavior among young people with alcohol and substance use disorders. *International Journal of Environmental Research and Public Health*, 18, 4337. <https://doi.org/10.3390/ijerph18084337> (IF 2.849)

**Rolová, G.**, Gavurová, B., & Petruželka, B. (2020). Exploring health literacy in individuals with alcohol addiction: A mixed methods clinical study. *International Journal of Environmental Research and Public Health*, 17, 6728. <https://doi.org/10.3390/ijerph17186728> (IF 2.849)

### b. Publications without IF

**Rolová, G.** (2020). Health literacy in residential addiction treatment programs: Study protocol of a cross-sectional study in people with substance use disorders. *Adiktologie*, 20(3–4), 145–150. <https://doi.org/10.35198/01-2020-002-0009>

**Rolová, G.**, Barták, M., Rogalewicz, V., & Gavurová, B. (2018). Health literacy in people undergoing treatment for alcohol abuse - A pilot study. *Kontakt*, 20(4), 425–431. <https://doi.org/10.1016/j.kontakt.2018.09.003>

## 2. Publications *in extenso* not related to this doctoral thesis

### a. Publications with IF

### b. Publications without IF

**Rolová, G.**, Miovský, M., & Barták, M. (2018). Veřejně dostupné zdroje dat a prevalence užívání návykových látek u rodiček, dětí a mladistvých a možnosti využití těchto dat pro prevalenční odhady pacientů a klientů. *Adiktologie v preventivní a léčebné praxi*, 1(4), 224–235.

**Rolová, G.**, Barták, M., Rogalewicz, V., & Šťastná, L. (2018). Prevalence poruch příjmu potravy u žen hospitalizovaných pro abúzus alkoholu. *Adiktologie* 18(1), 42–49.