

SHORT THESIS FOR THE DEGREE OF DOCTOR OF
PHILOSOPHY (PHD)

The potential of psychometric tools in the
field of screening for difficult-to-recognize
mental problems in primary care practice

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1. Background and objectives of the doctoral thesis

General practitioners occupy a strategically important place in people's lives. The average of 7 meetings per year makes the family doctor one of the most frequently visited health professionals. It is possible to build a more intimate relationship than usual between the family doctor and their patients, which can contribute to the building of trust, which may be necessary so that the people can turn to the specialist with their problems. A large proportion of patients with mental disorders appear in general practice, whose mental disorders can be more easily accepted in such a confidential, less stigmatized environment. However, there are still some psychiatric disorders that remain hidden from the family doctor due to their specific characteristics.

The doctoral thesis aims to facilitate the recognition of two of these more difficult-to-recognize mental problems, mild cognitive impairment (MCI) and health anxiety, for practicing general practitioners, thereby helping patients to access appropriate care.

Based on international data and surveys covering several countries, nearly a quarter of patients appearing in primary care suffer from some kind of mental disorder. Fewer data are available in Hungary, but in the studies carried out, rates similar to international ones were found. Mental disorders significantly impair health-related quality of life, especially depression, anxiety, and hypochondria. One of the fatal consequences of mental disorders can be suicide: 45% of those who commit suicide visit their family doctor a month before their fatal act.

General practitioners recognize roughly half of mental disorders. Scientists found that general factors such as health literacy, stigmatization, and characteristics of the health care system, but also person-specific characteristics such as the general practitioner's attitude, time available, or the patient's symptom presentation and even the concealing mentality of relatives can make recognition difficult.

The COVID-19 pandemic has had an extraordinary impact on the mental health of people worldwide, as a result of which psychological problems have increased. It made personal doctor-patient encounters difficult and made the identification of many mental disorders more challenging, further aggravating the situation and the proper care of patients.

MCI is often considered to be the anteroom of dementia, from which the conversion to dementia is approximately 50% in 5 years, however, some people do not develop dementia permanently and remain in the MCI state. It is distinguished from dementia by the fact that, despite the cognitive decline, the basic activities of everyday life are preserved or minimal disturbances can be detected only in the complex instrumental functions. While the prevalence of MCI among the average population over 60 years of age was found to be 5.9%, various studies found it to be 15.4-31.4% among patients of a similar age appearing in general practice. MCI is more difficult to recognize due to the attitude of the patient and the relative, as well as the characteristics of MCI.

Health anxiety is a form of anxiety centered on the belief that an individual has a serious illness or the fear of contracting a serious illness. The researchers imagine health anxiety on a spectrum, where a too-low level of health anxiety makes people irresponsible and, for example, they don't wear a mask during the pandemic, and because of a too-high level, appearances in the healthcare system become more frequent, and its pathological extreme is called hypochondria. According to its most accepted theory, health anxiety is based on early experiences, such as illness in the family. After this, the patient creates dysfunctional schemas, which are later activated by a critical event. Then negative automatic thoughts start, based on which cognitive, behavioral, and psychological changes take place, which then react to the negative automatic thoughts and reinforce themselves as a vicious circle. Among the average population, the frequency of hypochondria was found to be 0.4%, while among patients appearing in general practice, it was 2.95%. Patients with a high level of health anxiety use health services more often and their care is more expensive. Recognizing health anxiety is made more difficult by the fact that patients present the symptoms more likely as somatic.

Psychometric tools make it possible to quantify abilities and internal qualities and make them measurable and comparable. The important characteristics of psychometric instruments are reliability, which shows how consistently and stably a certain test measures the given construct that was intended to measure; as well as validity, which shows whether the test measures the symptom, phenomenon, or construct it was developed to examine.

To make MCI easier to recognize, we have selected a self-administered test already proven in the English-speaking world, Test Your Memory (TYM). The original TYM test is a series of 10 cognitive tasks printed on both sides of a sheet of paper to be completed by the patient with minimal supervision by a healthcare worker. The test covers a wide range of cognitive functions. The advantage of the test over other tests measuring cognitive functions is that it is self-administered, so it takes little medical staff energy. We translated this test used to screen for dementia in the first round, and then validated it for MCI during our research.

Regarding health anxiety, we examined the psychometric properties of an internationally accepted and Hungarian-validated questionnaire, the Short Health Anxiety Inventory (SHAI). The questionnaire consists of 18 items, and each item consists of a group of four statements, from which the person filling in chooses the one that best corresponds to the feelings experienced during the past six months. Each item is scored between 0 and 3 and must be summed to give a total score. The Hungarian questionnaire differs in that the items are scored from 1 to 4, so the total score falls between 18 and 72. The questionnaire is divided into 2 factors: the perceived probability of becoming ill and the perceived consequence of the illness. The former contains 14 items, the latter 4 items.

In addition to the fact that we tried to prove the usability of these two tests in general practice to identify MCI and health anxiety, we set ourselves the goal of making recommendations for general

practitioners, based on the properties of the test and the questionnaire, for the recognition and treatment of mental disorders appearing in general practice as well as to set an excellent example in the field of cooperation between professions.

2. Methods

2.1. Methods of the TYM-Hun validation study for the screening of MCI

We recruited 50 people: 25 MCI patients and 25 healthy controls (HC) for our observational cross-sectional study, which was conducted at the Psychiatric Clinic and Hospital of the University of Debrecen, between January 2018 and August 2019. The HCs were recruited from the relatives who accompanied the patients to the Clinic or Hospital, or to the outpatient clinic of these institutions. Individuals with a history of neurological disease, memory problems, or brain injury were excluded from the HC group. HCs were selected based on the absence of diagnostic criteria symptoms (according to DSM-5) of mild neurocognitive disorder. MCI was diagnosed according to the DSM-5 mild neurocognitive disorder diagnostic criteria.

The patients were seen and diagnosed by a psychiatrist and underwent a neurological examination, Mini Mental State Examination (MMSE), Alzheimer's Disease Assessment Scale-Cognitive Subscale (ADAS-Cog), structural imaging (e.g. CT, MRI), and blood sampling. According to the results of structural imaging and laboratory tests, there was no evidence of neurovascular or other neurological or systemic disease. In order to avoid the possible influencing effect of

depression, those subjects whose depressive symptoms were indicated by the Beck Depression Inventory (BDI) were excluded from further investigation. All participants gave their written informed consent and filled out all our questionnaires completely.

The normal distribution of the sample according to age was analyzed with the Shapiro-Wilk test, and the age difference between MCI patients and controls was analyzed with the Mann-Whitney U rank sum test. We also used the Mann-Whitney U test to examine the significance level of the difference in the mean of the TYM-Hun subtests of controls and MCI patients. The gender distribution was analyzed using the Fisher exact test, and the difference in the time spent in education was analyzed using the Kruskal-Wallis test. Spearman's rank correlation was used to examine the relationship between different tests and between test scores and MCI. The Receiver Operating Characteristic (ROC) curve, sensitivity, specificity, positive (PPV) and negative predictive values (NPV), Youden index, and area under the curve (AUC) were also determined. Statistical analysis was performed with STATA 11.1 (Statacorp LP. College Station, TX, USA) and SPSS® (v.26) software.

The ethics license was approved by the Hajdú-Bihar County Public Health Office in accordance with the recommendations of the Regional and Institutional Research Ethics Committee of the Medical and Health Sciences Center of the University of Debrecen (Permit number: DE OEC RKEB/ IKEB 3852–2013), which also guarantees that we carried out our investigation in accordance with the ethical

standards laid down in the Declaration of Helsinki in 1964. All participants gave their written informed consent for inclusion in the study.

2.2. Methods of a study measuring students' level of health anxiety

In our cross-sectional study, we used online, self-completed questionnaires created in Google Forms® (an internet-based survey tool). The data collection took place between April 30 and May 15, 2020, which period was one of the most stressful periods of the early stage of COVID-19 in Hungary when an official lockdown was ordered simultaneously with the closing of dormitories and the switch to online distance learning. We conducted our study at the University of Debrecen. In October 2019, the University had 28,593 enrolled students in various study programs, and 6,297 of them were international students.

We reached students through social media platforms (e.g. Facebook®) and the official student administration system, Neptun. The invitation link for our survey was sent to the students on the web-based platforms described above. By using the Neptun system, theoretically, the questionnaires of our survey reached all students of the University. Those students who were interested and willing to participate in our study could fill out our questionnaires anonymously during the specified study period, i.e. we used convenience sampling. All students of the University of Debrecen who were over 18 years old and were in Hungary during the epidemic were eligible to participate

in our study, whether they were undergraduate or postgraduate students.

In our study, during the survey, we collected information on the sociodemographic situation of the participants, including age (years), gender (female, male), field of study (health, non-health related), and whether the student stayed in Hungary during the study or went abroad. In our survey, we used three internationally accepted scales in order to obtain data on the health anxiety experienced during the crisis caused by the pandemic, coping styles and perceived stress, of which the thesis is based on and uses the data obtained on health anxiety. The Hungarian students were asked to fill out the Hungarian version of the survey and the validated Hungarian scales, the international students filled out the original scales in English.

Data were extracted from Google Forms® as an Excel spreadsheet for quality control and coding, and then SPSS® (v.25 and v.26) and RStudio statistical software were used to analyze the data. In order to examine the internal consistency of the SHAI, we calculated Cronbach's alpha, McDonald's omega, and theta. In order to analyze the factor structure of the SHAI, we performed a confirmatory factor analysis (CFA). The relationship between the two-factor structure and the obtained data was carried out in accordance with the original Hungarian validation study using the WLSMV method of the RStudio Lavaan package (chi/df; RMSEA; SRMR; CFI; TLI), while the corrected item-total correlation of the SHAI was performed using the

psych package. The p-value was set at less than 5% for statistical significance.

3. New scientific results of the thesis

3.1. Results of the TYM-Hun validation study on the screening of MCI

During our first study, we assessed the TYM-Hun results of 50 adults between the ages of 55 and 84. 25 MCI patients (average age 74.84 ± 6.22 years) and 25 HC participants (71.32 ± 7.69 years) were examined. The male-to-female ratio was 6:19 and 8:17 in the MCI and HC groups, respectively.

MCI patients scored an average of $39.52 \pm 5.73/25$ on the TYM-Hun test, $26.32 \pm 2.98/25$ on the MMSE, and $16.80 \pm 6.11/25$ on the ADAS-Cog. The average of the members of the HC group was $47.40 \pm 1.68/25$ on the TYM-Hun test, $29.04 \pm 1.06/25$ on the MMSE, and $5.80 \pm 3.64/25$ on the ADAS-Cog. Since the ADAS-Cog registers the number of errors, this test indicates less cognitive decline the fewer points the person who completes it scores. Spearman rank correlation was used to analyze the correlation of TYM-Hun, MMSE, and ADAS-Cog test scores with MCI. These are respectively: $\rho = 0.753$; $\rho = 0.551$; $\rho = -0.862$.

The age distribution of the sample differed significantly ($p < 0.001$) from the normal distribution, and no significant ($p = 0.058$) difference was observed between the average age of the MCI and HC groups. There was no significant difference in gender distribution between the

two groups ($p = 0.754$). These calculations assume that our sample was comparable in terms of age and gender. In the case of MCI patients, no significant difference was found between the average TYM-Hun scores of the subjects when we compared them according to their gender (male = 43.33, female = 38.32, $p = 0.060$). There were no significant differences even when we analyzed the sample according to the years spent in education (general school = 38.00; high school = 38.60; university = 41.55; $p = 0.467$).

We also used Spearman's rank correlation to calculate the correlation between MMSE, ADAS-Cog and TYM-Hun scores. Total TYM-Hun scores were significantly correlated with MMSE ($\rho = 0.626$; $p < 0.001$) and ADAS-Cog scores ($\rho = -0.723$; $p < 0.001$). A negative correlation was also observed between ADAS-Cog and MMSE ($\rho = -0.671$, $p < 0.001$).

According to the Youden index ($Y = 76.00\%$) and the square of the difference ($d2 = 4.16\%$), the ideal cut-off point should be 44/45 between HC and MCI patients. With this cut-off point, the true positive rate is 80.00%, the true negative rate is 96.00%, the positive predictive value (PPV) is 95.24% and the negative predictive value (NPV) is 82.76%.

If we use this cut-off point, the area under the ROC curve is 93.20% according to our sample. Based on the TYM-Hun points, we created the ROC curve, taking the presence/absence of MCI as a conditional variable.

By comparing the mean scores of the subtests of the HC sample with those of the MCI patients, we found that orientation, semantic knowledge, fluency, similarities, visuospatial 1, visuospatial 2 (i.e. the clock drawing test), anterograde memory, and help are the subtests the difference of which proved to be significant in addition to the overall test result.

According to the above, we can state that the TYM-Hun is a self-administered test that can reliably identify MCI under the order of a family doctor, without taking away significant personnel resources.

3.2. The results of the study measuring the level of students' health anxiety

During our study, a total of 950 Hungarian students filled out our questionnaire. Their average age was 24.96 (standard deviation: 8.11, median: 22, interquartile range: 4). 948 of them answered our question about gender and university faculty, and of them, 719 were female (75.84%) students, while 229 (24.26%) were male. Most of them, 690 (72.78%) attended the university's non-health-related faculties, while 258 (27.22%) were students of the health-related faculty.

Using the Hungarian scoring system, the average score of the SHAI for the 950 students who completed it turned out to be 34.69 (standard deviation 7.58), while the average value of the first factor, the perceived likelihood of becoming ill (SHAI-IL) was 26.97 (standard deviation 6.24), and the average score of the second factor, the perceived likelihood of illness (SHAI-IS), was 7.71 (standard

deviation 2.46). None of the items, factors, or the scores of the entire questionnaire showed a normal distribution.

In the case of the two-factor structure we examined, the fit indicators were good (CFI = 0.984; TLI = 0.982; Robust RMSEA = 0.042; SRMR = 0.047; $\chi^2/df = 3.587$, $p < 0.001$).

The internal consistency of the entire SHAI (as long as it was taken as one factor) proved to be similarly good, Cronbach's $\alpha = 0.866$.

When we examined it as a two-factor questionnaire, as was done in the international literature and the Hungarian validation study, the internal consistency values for the first factor were as follows: Cronbach's $\alpha = 0.865$, McDonald's $\omega = 0.874$, $\theta = 0.880$. Regarding the second factor, Cronbach's $\alpha = 0.732$, McDonald's $\omega = 0.742$, $\theta = 0.736$. Values above 0.8 are good, while values between 0.7 and 0.8 are in the acceptable range in terms of consistency.

According to the two-factor model, we examined the mean and standard deviation of each item and calculated the corrected item-total correlation. Based on these, the possibility arises that item 3 may be disadvantageous and therefore can be removed from the questionnaire, but after examining the internal reliability of the questionnaire without this factor, we do not get a significantly better result, so its exclusion is not justified.

Using the confirmatory factor analysis of the two-factor model carried out in accordance with the Hungarian validation study, we looked at

the standardized regression coefficients of the individual items. Based on the standardized regression coefficients and the item correlation, items 3, 14, and 16 seem to be the weakest, but overall the fit indicators are good, so it is not necessary to remove these items.

Based on this, we can say that in the SHAI we managed to identify a questionnaire that can reliably identify health anxiety without any changes, as well as separate it from other mental disorders in general practice.

4. Discussion

Based on our results, it can be said that two mental disorders, MCI and health anxiety, can be reliably screened by the test and questionnaire we examined, which are fundamentally difficult to recognize in routine general practice, and the failure to recognize them can cause a lot of nuisances for professionals.

However, the use of psychometric tools alone does not solve the difficulties of family doctors and people living with mental problems. Based on the recommendations in the literature, it is necessary to educate the general population and professionals and fight against stigmatization. General practitioners should participate in further training and can combine their knowledge with the use of screening instruments. In terms of organizational changes, it is recommended to extend the time per patient and cooperate with specialists. General practitioners can be encouraged to take care of mental problems in their area within their competence. These changes should be applied in the long term and in combination.

5. Summary

The thesis examines the role of psychometric screening tools in the identification of mental problems that are often difficult to recognize in general practice. A non-negligible part of the patients who appear in primary care suffer from a mental problem, but at the same time, it is very common that they do not report this in their complaints to the doctor, however, the efficiency of recognition can be improved by using screening tools.

The thesis highlights two of the screening tools and related mental disorders. The first tool is the Test Your Memory (TYM-Hun) test, and the mental problem associated with it, which is often difficult to recognize, due to the relative's and the client's attitude that covers up the symptoms, the mild cognitive impairment (MCI) which in half of the cases can be considered a pre-dementia condition. The second tool is the Short Health Anxiety Inventory (SHAI) which helps the clinician to raise the possibility of a mental problem, health anxiety, or its extreme manifestation, hypochondria which often manifests as a somatic illness in primary care.

With the help of our tests, we were able to prove that the TYM-Hun is a sensitive measuring instrument in the detection of EKZ, which, using the cut-off value of 44/45, recognizes 80% of the true positive cases, while only 4% of the true negative cases are identified as positive. Based on this, its utilization is recommended in general practice, and due to its self-administered nature, it can be easily implemented in the majority of cases, even in the case of shorter

available time. In the case of the SHAI, the internal consistency of the questionnaire was found to be good, using the two-factor model, for the first factor, the Illness Likelihood, the value of Cronbach's alpha was 0.865, McDonald's omega 0.874 and theta 0.880, while for the second factor, the Illness Severity, these were also acceptable and we obtained the following indicators respectively: 0.732; 0.742 and 0.736.

The chances of recognizing a high proportion of patients suffering from mental problems appearing in general practice can be increased by using several factors, among which the following can be highlighted: psychoeducation; continuing education; systemic changes, including improving the conditions of practice and the sustained practice of a collaborative patient care model; and last but not least, the application of up-to-date international guidelines in practice, including the use of screening instruments.



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List of publications related to the dissertation

1. **Garbóczy, S.**, Szemán-Nagy, A., Ahmad, M. S., Kolozsváriné Harsányi, S., Ocsenás, D., Rekenyi, V., Al-Tammemi, A. B., Kolozsvári, L. R.: Health anxiety, perceived stress, and coping styles in the shadow of the COVID-19.
BMC Psychol. 9 (1), 1-13, 2021.
DOI: <http://dx.doi.org/10.1186/s40359-021-00560-3>
IF: 2.588
2. **Garbóczy, S.**, Magócs, É., Szöllösi, G. J., Kolozsváriné Harsányi, S., Égerházi, A., Kolozsvári, L. R.: The use of the Hungarian Test Your Memory (TYM-HUN), MMSE, and ADAS-Cog tests for patients with mild cognitive impairment (MCI) in a Hungarian population: a cross-sectional study.
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List of other publications

3. Kolozsvári, L. R., Rekenyi, V., **Garbóczy, S.**, Hógye-Nagy, Á., Szemán-Nagy, A., Sayed-Ahmad, M., Héjja-Nagy, K.: Effects of Health Anxiety, Social Support, and Coping on Dissociation with Mediating Role of Perceived Stress during the COVID-19 Pandemic.
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DOI: <http://dx.doi.org/10.3390/ijerph20085491>
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9. **Garbóczy, S.**, Szemán-Nagy, A., Ahmad, M. S., Kolozsváriné Harsányi, S., Ocsenás, D., Rekenyi, V., Tischler, P., Al-Tammemi, A. B., Kolozsvári, L. R.: The Emergence of Dissociative Experiences as a Function of Perceived Stress Among University Students During the COVID-19 Lockdown.
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