

Psychometric tests and a complex assessment of the course of alcohol dependence

PhD Thesis – Summary

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Szeged

2015

Papers the thesis is based on:

- I. **Andó B**, Kökönyei G, Paksi B, Farkas J, Rózsa S, Demetrovics Z (2009) A 7 tételű szenzoros élménykeresés kérdőív (SSS-7-HU) bemutatása. *Mentálhigiéné és Pszichoszomatika* 10(2):139-152.
- II. **Andó B**, Must A, Kurgyis E, Szkaliczki A, Drótos G, Rózsa S, Szikszay P, Horváth S, Janka Z, Almos PZ (2012) Personality traits and coping compensate for disadvantageous decision-making in long-term alcohol abstinence. *Alcohol Alcohol* 47(1):18-24. **IF: 1.956**
- III. **Andó B**, Rózsa S, Kurgyis E, Szkaliczki A, Demeter I, Szikszay P, Demetrovics Z, Janka Z, Álmos PZ (2014) Direct and indirect symptom severity indicators of alcohol dependence and the personality concept of the biosocial model. *Subst Use Misuse* 49(4):418-26. **IF: 1.226**
- IV. Töreki A, **Andó B**, Dudas RB, Dweik D, Janka Z, Kozinszky Z, Keresztúri A (2014) Validation of the Edinburgh Postnatal Depression Scale as a screening tool for postpartum depression in a clinical sample in Hungary. *Midwifery* 30(8):911-918. **IF: 1.707**
- V. **Andó B**, Álmos PZ, Németh VL, Kovács I, Fehér-Csókás A, Demeter I, Rózsa S, Urbán R, Kurgyis E, Szikszay P, Janka Z, Demetrovics Z, Must A (2015) Spirituality mediates state anxiety but not trait anxiety and depression in alcohol recovery. *J Subst Use* (in press). **IF: 0.753**

Cumulative impact factor: **5.642**

1. Introduction

In order to understand the course of alcohol dependence (AD) more deeply, carefully selected and psychometrically evaluated psychological tests are essential. In recent decades, few psychometric tests have been widely and systematically standardized on Hungarian samples. Nevertheless, this tendency seems to be changing as more and more psychometric data are becoming available. This work in certain respects relates to this tendency. In this work, basic psychometric indices are first assessed on distinct samples, involving tests with different theoretical backgrounds. On the other hand the focus will be placed on the assessment of AD with psychometric tests; personality and neurocognitive characteristics are presented in the context of the course of AD.

1.1. Significance of clinical psychometrics

“Psychometrics, or quantitative psychology, is the disciplinary home of a set of statistical models and methods that have been developed primarily to summarize, describe, and draw inferences from empirical data collected in psychological research”. Psychological/psychometric testing enables clinicians and researchers to operationalize the dimensions of intelligence, personality and the symptoms that reflect clinical conditions. This promotes a better understanding of individual problems and diseases and the development of intervention strategies for psychological/psychiatric disturbances.

In psychological/psychometric testing, reliability and validity are the most important questions regarding the goodness of operationalization. The repeatability of measurement reflects to reliability, while the test validity shows the degree to which it measures what it is supposed to measure. Generally, this can be confusing because it implies that there are sole indices of reliability and validity. For the evaluation and further understanding of complex disorders such as AD psychological/psychometric tests are crucial.

1.2. Assessment of the course of AD with psychometric tests: self-reported measures and neurocognitive assessment

In the assessment of AD and related problems, well-validated psychometric tests are essential. In the different phases of the disorder, different tests can be informative. The direct severity indicators of AD evaluate the quantity and frequency of use, the withdrawal phenomena and the negative consequences of drinking. Through indirect indicators of dependence severity, the addiction potential can be revealed through the general lifestyle characteristics and personality traits often associated with substance abuse.

Maladaptive personality traits are connected with the developmental, clinical and treatment aspects of AD. For revealing the comprehensive personality characteristics associated with AD, most researchers operationalize temperament and character factors (Temperament and Character Inventory-TCI). In the field of neuropsychology and addiction, among the executive functions, the decision-making mechanisms measured by the Iowa Gambling Task (IGT) seem to play a central role. There are at least two reasons for this: decision-making (DM) deficits are the core features of addictions, and even after long-term alcohol abstinence, DM deficits are still present. Via these personality and neurocognitive measures, subgroups of patients and the different phases of AD can be characterized more precisely. These psychometric tests promote a deeper understanding of AD and the planning and evaluation of the efficacy of therapeutic interventions.

2. Aims

AIM1: The reliability indices should be excellent in the case of instruments which are involved in clinical practice and directly affect the treatment of the patient (e.g. Alcohol Use Disorders Identification Test - AUDIT and Edinburgh Postnatal Depression Scale - EPDS). Internal consistency (Cronbach α) was therefore systematically assessed in the case of these 2 measures (AUDIT and EPDS) It was hypothesized that these clinical tests both have a superior Cronbach α compared with a short personality trait measure (the short form of Sensation Seeking Scale - SSS) used in epidemiological studies, mainly for research purposes (see STUDY1).

AIM2: The validity of widely used addiction-related self-reported direct and indirect severity measures is evaluated: MacAndrew Alcoholism Scale–Revised (MAC-R), Addiction Potential Scale (APS), Addiction Admission Scale (AAS), AUDIT and Severity of Alcohol Dependence Questionnaire (SADQ). Based on the assessment of validity, the following question is raised relating to the psychometric tests: “Does it measure what it purports to measure?” (see STUDY2).

AIM3: Another goal of the present thesis was to reveal the temperament and character factors related to AD and symptom severity. The TCI-R profiles of individuals with alcohol dependence (ADPs) were compared with those of normal controls. Numerous studies have compared ADPs with controls on the basis of temperament and character factors; however, no information is available on the strength of these differences. In this study, therefore, TCI-R profiles of ADPs were compared and the Cohen’s *d* was calculated in order to find the most powerful TCI-R factor related to AD. The main question was whether the severity of symptoms of AD could be explained by temperament and character factors (see STUDY3).

AIM4: Previous studies have demonstrated a persistent DM deficit in AD even after long-term abstinence. It is assumed that patients are able to maintain sustained abstinence in spite of the DM deficit. Therefore, the aim was to reveal specific personality features of the biosocial personality model, presumed to compensate for ineffective DM skills (see STUDY4).

AIM5: An additionally goal of the present work is to assess the further role of spirituality in alcohol recovery. For this reason, in a cross-sectional study spiritual orientation is represented by means of Self-transcendence (ST), a character factor of the Cloninger biosocial model of personality. In addition to transcendental orientation, anxio-depressive symptoms were also monitored. We tested three different alcohol treatment settings, which differently involve elements of spirituality, in order to reveal the possible mediator effects on the levels of depressive and anxiety symptoms (see STUDY5).

3. Methods: participants, measures, data analysis

3.1. STUDY1: Reliability assessment of psychometric tests

The psychometric assessment of the SSS was performed on a Hungarian representative sample. For further psychometric evaluation of the SSS a special population sample was involved. For the assessment of EPDS, a screening psychometric test for perinatal depression, women participated in the study between the sixth and eighth weeks after delivery. To reveal the reliability indices of alcohol-related psychometric tests (AUDIT, SADQ) patients were recruited from inpatient centers at the University of Szeged Addiction Ward and the Hospital of Szigetvár Addiction Ward. For the assessment of reliability the Cronbach α , item-total correlations, Cronbach α value without the item and Guttman split-half coefficient were analyzed in order to reveal the internal consistency of the instruments.

3.2. STUDY2: Validity assessment of psychometric tests

To reveal the validity indices of alcohol-related psychometric tests patients were recruited from inpatient centers at the University of Szeged Addiction Ward and the Hospital of Szigetvár Addiction Ward. AUDIT and SADQ total scores were correlated in order to assess convergent validity. Furthermore 123 people from the database created as a normative sample of the Hungarian population for the MMPI-2 were matched to ADPs in order to reveal the sensitivity and specificity of MAC-R, APS and AAS by Receiver operating characteristic analysis (ROC) analysis.

3.3. STUDY3: Personality and AD in the light of psychometric tests

Eighty-one ADPs were recruited from inpatient centers and 166 control subjects from the normative Hungarian TCI-R database were matched by age, gender and level of education. All ADPs completed the TCI-R, AUDIT, SADQ, MAC-R and APS. The Cohen's d was calculated in order to reveal the most powerful differences between the TCI-R dimensions among the ADPs and the matched control group. Partial correlation analyses were conducted in order to assess addiction severity indicators connected with temperament and character factors, independently of age and gender. Four regression models were constructed, where the independent variables were gender and age, and the 7 temperament and character factors. The dependent variables in the models were: SADQ, AUDIT-T, MAC-R and APS.

3.4. STUDY4: Neurocognitive and personality determinants of long-term alcohol abstinence

The study group comprised 88 patients with a lifetime diagnosis of alcohol dependence based on the DSM-IV. Participants were arranged in two groups based on the length of abstinence. The short-term abstinent (STA) group (N=43) comprised patients currently participating in the inpatient MM based treatment programme, the long-term abstinent (LTA) group (N=45) comprised participants characterized by abstinence longer than 3 years, at that time attending AA groups. As the neurocognitive assessment of DM was also included in the study, only participants with intact general cognitive functioning (IQ scores above 90) were enrolled. The computerized 'ABCD' version of the Iowa Gambling Task (IGT) was administered to assess the decision making ability and adequacy. In this study participants completed the TCI-R to assess personality domains. Addiction Severity Index (ASI) was used for the assessment of demographic and alcohol consumption-related variables (i.e. age at onset of regular alcohol consumption, and duration of problematic drinking in years). This interview was complemented with a question indicating the length of abstinence (i.e. "When was the last time you drank alcohol?"). Group differences in sociodemographic and alcohol use-related variables were tested by using 2-tailed, independent-sample t-tests and Mann-Whitney probes for continuous variables, and chi-squared probes for categorical variables.

Group performances in the IGT and TCI-R were compared by using a multivariate analysis of covariance (MANCOVA) approach. Univariate analysis of variance (ANOVA) with linear trend analysis was performed for both groups to evaluate DM efficacy and the presence of a learning effect.

3.5. STUDY5: Recovery from AD: 12 steps and the role of spirituality

One hundred and sixty nine participants were enrolled in the study, all meeting the DSM-IV diagnostic criteria for lifetime AD. In order to be able to assess the mediating role of spirituality in the reduction of anxiety and depressive symptoms, subjects were recruited from three different treatment settings. Based on the treatment protocols, these treatment settings involve spirituality at different levels. These were (1) detoxification (no spiritual component of the formal treatment; mainly pharmacotherapy), (2) long-term (12-step-based) therapeutic community treatment (lower spirituality; 1-4 steps studied extensively), and (3) at least 3

years of AA attendance after the long-term (12-step-based) therapeutic community treatment (high spirituality; 1-12 steps studied). Thirty-four of the 169 subjects were hospitalized for detoxification purposes (detoxification group; DTG) while 89 were hospitalized in a long-term therapeutic community programme based on the 12-step approach and the Minnesota Model (MM) (therapeutic community group; TCG), a further 46 participants were regular (at least once a week) AA group attendees. The present study focuses on the ST character factor measured by TCI-R. The Beck Depression Inventory (BDI) was administered to quantify the severity of current depressive symptoms and the anxiety symptoms were assessed with the State-Trait Anxiety Inventory (STAI).

Group differences in sociodemographic and alcohol use-related variables were tested by using one-way ANOVA and Kruskal-Wallis analysis. Group performance on the TCI-R-ST, BDI, STAI-State and STAI-Trait were compared by using one-way univariate ANOVA with the LSD post-hoc test. For the mediation analysis we performed a path analysis with the MPLUS 7.0 programme, and maximum likelihood estimation robust to the deviation from normal distribution (MLR) was used to estimate the model.

All of the study protocols were approved by the local Research Ethics Committee. Informed consent was obtained.

4. Results

4.1. STUDY1: Reliability assessment of psychometric tests

In order to create a shorter sensation-seeking measure which preserves good reliability indices, the internal consistency of the questionnaire, containing 9 statement-pairs, was first examined on two independent samples. The most appropriate reliability indices were revealed by deleting item 9 and 7. The AUDIT and EPDS are involved in clinical practice for screening purposes; the psychometric indices should therefore be excellent. These two widely used measures were analysed on the basis of the internal consistency. The reliability of the EPDS in terms of the Cronbach α coefficients showed good internal consistency (Cronbach $\alpha=0.75$) furthermore, the reliability of the AUDIT also showed good internal consistency (Cronbach $\alpha=0.791$). The SADQ specifically assesses the severity of AD and on a Hungarian clinical sample shows excellent reliability indices: Cronbach $\alpha=0.909$.

4.2. STUDY2: Validity assessment of psychometric tests

In this section, the results of addiction-related psychometric tests are presented. The convergent validity was tested by the correlation of the SADQ with AUDIT; an already validated test on Hungarian sample. The Pearson correlation revealed a significant correlation between the SADQ and AUDIT ($r=0.537$, $p<001$), indicating that SADQ is also a valid measure for alcohol-related problems. The assessment of the criterion validity for the MAC-R, APS and AAS was carried out via ROC analysis. According to the results, all the dependency scales have good diagnostic sensitivity, though the combination of the three curves gives the best sensitivity and specificity values at the 0.66 cut-off point, with 55 correctly identified patients and only 8 false-negatives and 19 false-positives.

4.3. STUDY3: Personality and AD in the light of psychometric tests

Among the temperament and character factors, the ADPs displayed significantly higher levels of novelty seeking (NS) and harm avoidance (HA) and a lower level of persistence (P) and cooperativeness (C) as compared with the normal controls. The magnitude of Cohen's d effect indicated that the character factor self directedness (SD) is the most powerful contributor to alcohol dependence. To reveal the temperament and character background of the clinical symptoms of AD, partial correlation analysis was used (controlled for gender and age). Significant negative correlations were found between MAC-R and HA, and significant positive correlations between SADQ and NS, MAC-R and NS, MAC-R and P, APS and NS, and AUDIT-T and NS. To find the strongest TCI-R predictor in the SADQ, AUDIT, MAC-R and APS, stepwise linear regression analysis was applied. NS proved to be the strongest predictor in the SADQ, MAC-R, APS and AUDIT.

4.4. STUDY4: neurocognitive and personality determinants of long term alcohol abstinence

Group differences in IGT performance were tested by using two statistical approaches. MANCOVA was performed to compare IGT scores for each of the 5 blocks, with age as a covariate. The two groups did not differ significantly in DM performance ($F_{1,82}=0.21$, $p=0.96$) and age ($F_{1,82}=0.98$, $p=0.43$) nor gender ($F_{1,82}=1.05$, $p=0.31$) had an effect on the IGT performances. In addition to this, univariate ANOVA with linear trend analysis was performed for both groups to examine a possible learning effect improving DM efficacy along

the 5 IGT blocks. No marked linear improvement in IGT performance was observed in either group (STA $t_{4,210} = 0.661$, $p = 0.509$ and LTA $t_{4,220} = 1.461$, $p = 0.146$). For a better understanding of the dimensions that differentiate between the LTA and STA groups, TCI-R scales were examined and significant differences were found in three measures. The LTA group achieved markedly higher scores on scales of SD ($F_{1,85} = 24.73$, $p < 0.001$, observed power=0.99,) and C ($F_{1,85} = 8.314$, $p = 0.005$, observed power=0.81) (Table 2), while the STA group scored significantly higher on the HA scale ($F_{1,85} = 4.17$, $p = 0.04$, observed power=0.52). An analysis of observed power revealed that SD is the most powerful contributor to LTA ability.

4.5. STUDY5: Recovery from AD: 12 steps and the role of spirituality

The different treatment approaches showed different levels of spirituality, anxiety and depressive symptoms. In the mediation analysis, the treatment effect was tested on mental health outcome such as depression, trait and state anxiety. Both the TCG with a lower spirituality component and AAG with a stronger spiritual component had significant direct effects on depression as well as on trait anxiety and state anxiety as compared with the DTG without any formal spiritual component. However, the indirect mediating effect of spirituality was significant only in the case of state anxiety.

5. Discussion

This thesis had multiple aims. Psychometric indices were presented for clinical tests and the major focus was on addiction related-measures. Direct and indirect AD severity indicators were evaluated psychometrically and in the light of the biosocial personality model. Furthermore, as a result of the multifaceted nature of AD, complex psychological assessments including personality and specific neurocognitive correlates were determined along the course of this disorder.

By using the short form of the SSS, it was demonstrated that the test psychometric indices are dependent on the sample, confirming the idea that a psychometric test can be more reliable under one condition than under another. The determination of the number of test items is crucial. In this work, a new short questionnaire for measuring the sensation-seeking trait is presented: the SSS-7-HU. Widely used screening tests such as the AUDIT and EPDS contain internationally determined 10 items. It should be emphasized that these measures directly affect the treatment of individuals, in contrast with the SSS-7-HU, which is mainly used for

research purposes. The results indicate that the AUDIT and EPDS have similar, but better reliability indices than the SSS-7-HU, though the latter can also be regarded as optimal. The AUDIT has already been validated on a large Hungarian sample. In addition, this study confirms its optimal psychometric properties on a clinical sample. Another direct addiction severity indicator, the SADQ, is also recommended in international alcohol treatment protocols (e.g. NICE). The results of this work indicate that the SADQ is a reliable and valid measure for the assessment of symptom severity in AD. The SADQ possesses optimal internal reliability and convergent validity indices. However, it must also be emphasized that more examinations are needed on different Hungarian samples for a more accurate psychometric characterization of this essential psychometric measure. This study focused on the addiction scales (MAC-R, APS and AAS) of the MMPI-2 and confirmed that these indirect severity measures are valid in the detection of patients with AD. It is clear from the results that all the dependency scales have acceptable diagnostic sensitivity, although the combination of these three measures gives the best sensitivity and specificity values.

This work also identified the temperament and character factors related to AD and revealed the most powerful personality determinant of AD measured by the TCI-R. Furthermore, multiple symptom severity measures (AUDIT, SADQ, MAC-R and APS) were used to reveal the relationships between the symptomatology of AD and personality structure.

The temperament and character factors indicated that ADPs display characteristic differences as compared with normal controls. A higher level of NS and a lower level of SD were found among ADPs. The greatest difference between the two groups was found in the character factor SD indicated by Cohen's *d*. This strong relationship between AD and SD reveals that ADPs have less ability to control and maintain goal- and value-oriented behaviour. A significantly lower score for C was found among ADPs, indicating hostile, revengeful and opportunistic characteristics. Lower scores for SD and C are associated with a higher risk of symptoms of personality disorders. The results also revealed that temperament and character factors are related to the complex symptomatology of AD, measured by means of both direct and indirect severity measures.

Among the personality factors assessed, a key role in the understanding of the direct severity indicators of AD is played by NS, since only this factor is connected with these severity indicators. Moreover, this temperament dimension is strongly associated with the indirect severity indicators, showing that a higher NS is connected with a higher addiction potential.

NS is the strongest correlate of the severity of the clinical symptomatology of AD. Furthermore, this personality factor is the most powerful determinant of severe AD and a higher level of alcohol intake.

For a further understanding of AD, long-term abstinent patients were evaluated. The complex nature of addictive behaviour demands an integrative research approach combining neuropsychological and personality measures. Besides TCI-R factors, IGT, a neurocognitive indicator of DM was administered.

The comparison of ADPs at the beginning of the recovery process with patients managing to maintain long-term abstinence allows assessing the associations of DM abilities and personality factors with abstinence length. The findings provide new evidence of a persistent DM deficit in AD. The maladaptive DM strategy strongly influenced by immediate reward preference and disregarding long-term negative consequences is similarly present at the beginning and after several years of abstinence. The IGT performance of both the STA and LTA groups was not significantly better than chance, as indicated by mean DM capacity scores consistently around zero. Any effects of psychotropic medication on DM performance can be excluded, since all patients were unmedicated at the time of participation. The intact global cognitive status of participants was ensured by the inclusion criteria of an IQ above 90. Despite persistent DM deficits, ADPs can achieve long-term abstinence. This raises the possibility of other influencing factors that compensate for the non-adaptive executive strategy. Here the major personality determinant of AD in relation to abstinence length was studied: the biosocial personality model. The LTA group studied here achieved markedly higher scores on scales of SD and C. In addition, lower levels of HA were measured. The integration of these temperament and character dimensions results in a more adaptive personality profile. It was found that SD is the most powerful predictor of LTA. This indicates higher levels of autonomy, reliability, responsibility and maturity. Additionally, as this work revealed, this character factor of the biosocial personality model is the most powerful contributor to “actual” AD too. In summary, it is proposed that the more adaptive personality profile of the LTA patients described here contributes to the compensation of the trait-like DM deficit in AD.

Spirituality, a major component of 12 steps based AD treatments was assessed in relation to anxiodepressive symptoms in three different formal alcohol treatment models. These treatment models incorporate spirituality differently: during the detoxification phase the spiritual component of the formal treatment is not present, while in the rehabilitation phase (1-4 steps) and in AA groups (1-12 steps) patients complete “step-work”. The results confirmed

that detoxification treatment, long term (12-step-based) therapeutic community treatment, and at least 3 years of AA attendance differed significantly in terms of the experienced level of spirituality by the patients. The patients in long-term 12-step-based rehabilitation and in sustained AA attendance displayed more pronounced spirituality than those in detoxification treatment. Our results also confirmed that the three different treatment models differed significantly according to the anxiety and depressive symptoms showed by the patients.

The major finding is confirmation that spirituality is a mediating factor within the treatment and, as such, decreases state anxiety. This mediation was not detected, however, in the case of either depressive symptoms or trait anxiety. These results therefore emphasize the beneficial acute effect of the spiritual domain in the context of 12-step-based interventions, but it seems that this effect can be maintained only by regular attendance, as spirituality does not seem to play any mediating role in the reduction of trait anxiety. On the other hand, other components of the long-term therapeutic community treatment and of the AA attendance contribute significantly to the reduction in depressive symptoms and trait anxiety.

The assessment of psychometric indices in the field of addiction is crucial. A complex approach is more informative and could further help to form individualized treatment for patients with AD.

6. Acknowledgements

I would like to express my gratitude to Professor Zoltán Janka for his endless support and guidance to carry out this thesis. I am also grateful to Péter Álmos for the continuous support and encouragement. I am also thankful and indebted to Anita Must for sharing her expertise to me. I would like to express my gratitude to Petronella Szikszay, Zsolt Demetrovics and Sándor Rózsa for the kind support and cooperation. I wish to express my sincere thanks to Professor János Kálmán for providing me the conditions to work on this thesis. I am thankful to Nóra Domján and Eszter Kurgyis for the continuous professional and friendly support.

I would like to give credit to all participants and co-authors of these studies. Furthermore, I take this opportunity to express gratitude to all of the Colleagues for their help and support. I would also like to thank my family, friends and loved ones for their encouragement, support and attention.