Excellent reliability and validity of the Addiction Medicine Training Need Assessment scale across four countries.

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Abstract

BACKGROUND: Addiction is a context specific but common and devastating condition. Though several evidence-based treatments are available, many of them remain under-utilized, among others due to the lack of adequate training in addiction medicine (AM). AM Training needs may differ across countries because of difference in discipline and level of prior AM training or contextual factors like epidemiology and availability of treatment. For appropriate testing of training needs, reliability and validity are key issues. The aim of this study was to evaluate the psychometric properties of the AM-TNA Scale: an instrument specifically designed to develop the competence-based curriculum of the Indonesian AM course.

METHODS: In a cross-sectional study in Indonesia, Ireland, Lithuania and the Netherlands the AM-TNA was distributed among a convenience sample of health professionals working in addiction care in The Netherlands, Lithuania, Indonesia and General Practitioners in-training in Ireland. 428 respondents completed the AM-TNA scale. To assess the factor structure, we used explorative factor analysis. Reliability was tested using Cronbach's Alpha, ANOVA determined the discriminative validity.

RESULTS: Validity: factor analysis revealed a two-factor structure: One on providing direct patient treatment and care (Factor 1: clinical) and one factor on facilitating/supporting direct patient treatment and care (Factor 2: non-clinical) AM competencies and a cumulative 76% explained variance. Reliability: Factor 1 $\alpha = 0.983$ and Factor 2: $\alpha = 0.956$, while overall reliability was ($\alpha = 0.986$). The AM-TNA was able to differentiate training needs across groups of AM professionals on all 30 addiction medicine competencies ($P = .001$).

CONCLUSIONS: In our study the AM-TNA scale had a strong two-factor structure and proofed to be a reliable and valid instrument. The next step should be the testing external validity, strengthening discriminant validity and assessing the re-test effect and measuring changes over time.

Highlights

1. Tailored training of health professionals is one of the elements to narrow the “scientific knowledge-addiction treatment” gap.

2. In Addiction Medicine (AM), Training Need Assessments (TNA) are rarely used.

3. The AM-TNA scale is a reliable, valid instrument to measure addiction medicine training needs.

4. The AM-TNA helps to determine the profile of future addiction specialist.

5. The AM-TNA assists tailoring training to national, individual and group addiction priorities.

Acknowledgements and Authors contributions

Lucas Pinxten and Cor de Jong conceptualized the AM-TNA scale and collected the data in The Netherlands. In Indonesia, Shelly Iskandar and Astri Parawita Ayu collected the data and Reynie Purnama Raya, and Efi Fritiana contributed to the statistical analysis. In Lithuania, Emilis Subata and Ramune Mazaliauskiene of the Vilnius Center for Addictive Disorders, translated the AM-TNA into the Lithuanian language while Darius Jokubonis and Ramune Mazaliauskiene collected the data. In Ireland, Mairead Egan and Gerrard Bury from the School of Medicine, University College Dublin, supported data collection, data analysis and manuscript preparation. Arnt Schellekens, Jan Klimas and Helen Tobin supported the research project and contributed final reporting of this study.

1.1 Introduction:

Addiction is a chronic disorder, which affects about 10% of the world population and contributes to 12.4% of all deaths worldwide (WHO, 2018). There is ample evidence that substance use disorders (SUD) are often complicated by mental and physical conditions, leading to many medical, behavioral and social problems. This contributes to huge societal costs in terms of direct medical costs and indirect societal costs (e.g., accidents, absenteeism, criminality) (Degenhardt, 2010, 2011, WHO, 2017). An increasing variety of evidence-based treatments for addiction, including psychological, social, and pharmacological interventions, are available. However, these addiction treatments are only available in 30% of the countries, and only a limited number of patients receive proper treatment (Cape, 2006, Ayu, 2015, WHO 2017, 2018).

This gap between scientific knowledge and daily addiction treatment partly results from the lack of adequate training in addiction medicine (AM) of health care professionals in many countries. Last decade, increased attention is being placed on competence-based education as a means for optimizing the initial and postgraduate education of health professionals (Gruppen, 2010). As a result, in some countries, like Canada, the US, UK, and The Netherlands, competence-based postgraduate AM education is well established; however, this is not the case at a global scale

(Pinxten, 2013). For the development of AM curricula, it is important to know what specific AM competencies should be taught to different health professionals, at different levels of education and specialization. Also, little is known about such differences in training needs across professional working in different countries. A systematic Training Need Assessment (TNA) can guide curriculum development, set national, individual or group training priorities and determine what the profile of future AM trainees should be. Hence the development of a TNA containing specific AM competencies is a logical first step to tailor AM training curricula to national, individual and group training needs.

Hall et al. (1997) were the first to describe the development of a 'Substance Abuse Training Need Assessment' (SATNA) instrument with good psychometric properties and its use to tailor AM training. The SATNA covers 20 general addiction-training domains and includes no specific AM competencies. The Addiction Medicine-Training Need Assessment Scale (AM-TNA), covering 30 core-AM competencies, was specifically developed to tailor the Indonesian competence-based post-graduate AM curriculum for medical professionals: addiction-physicians, psychiatrists, and nurses in Indonesia (Pinxten, 2011). Compared to the AM-TNA, the SATNA is too general to optimize competence-based postgraduate AM education. Ever since only two small-scale studies described the use of the AM-TNA scale, as guidance in AM curriculum development. These studies showed moderate reliability of the AM-TNA in an Indonesian (n=27) sample (Pinxten, ibid). An explorative factor analysis of a merged, though small, Indonesian and Lithuanian dataset (n=123) revealed a four-factor structure, which, after varimax-rotation, resulted in a cumulative explained variance of 57.5 percent (Pinxten, 2013).

The AM-TNA scale can only be used as a valuable instrument for AM curriculum development and for training needs ascertainment unless evaluation of reliability and validity - a key requirement for any psychometric instrument - is well established. In this study, we aim to further establish the psychometric properties of the AM-TNA. We performed a large-scale international study of the AM-TNA among medical professionals in Indonesia, Ireland, Lithuania, and the Netherlands: a sample in which medical professionals differed in both the level and background of their professional AM training. Our research questions were: 1) What is the factor

structure of the AM-TNA? 2) What is the reliability of the AM-TNA, and 3) Can the AM-TNA differentiate training needs of professional AM disciplines across the 4 countries?

2.0. Methods

2.1. Design

We used a cross-sectional, comparative design to assess the psychometric aspects of the AM-TNA.

2.2. Countries and participants

In order to assess whether the instrument measures professional AM training need differences, we included participants from The Netherlands, Lithuania, Indonesia and Ireland because these countries strongly differ in AM training programs. A convenience sampling approach was used: The Netherlands: AM professionals joining a scientific meeting (n=67), physicians participating in the Dutch Master Degree Course in Addiction Medicine (MIAM) (n=30) and Psychiatrists in-training participating in a general tailor-made AM training (n=21). Indonesia: addiction professionals, involved in the development of the Indonesian Addiction Medicine Course (I-SCAN) (n=27) and addiction physicians participating in the I-SCAN (n=76). Lithuania: Psychiatrists of the Kaunas Branch of the Lithuanian Professional Psychiatrists Organization, joining a routine scientific meeting (n=70). Ireland: GP trainees in their 3rd and 4th (final) years) attending the annual Network of GP Trainees (NGPT) Conference in Kilkenny (n=136). Adding to a total of 428 respondents. Respondents with over 10% of missing values on the questionnaire (Indo: 1, Lit: 1, Ire: 23) were excluded from the analysis. Because of the small number, the missing values (<4 missing scores on the AM-TNA per respondent) (Indo: 7, Lit: 4, Ire: 31) were imputed by hand, using the average score per item, per country.

2.3. The Instrument

The AM-TNA was developed in 2010 in Bandung, Indonesia as a tool to develop the

Indonesian Addiction Medicine Course (ISCAN) (Pinxten, 2011a) and part of the IMPACT international university collaboration program (Pinxten, 2011b). The AM-TNA is a 30 items questionnaire containing self-reported perceptions of the proficiency on specific AM core competencies, using a five-point Likert scale: from not at all proficient (1) to fully proficient (5). In 2012 the Indonesian AM-TNA was translated into Dutch, Lithuanian and English, back translated, pretested for accuracy and validated by a panel of 5 addiction experts, in line with World Health Organization validation of research tools procedures (WHO, 2016). The AM-TNA questionnaire covers a variety of competencies, including the skills in three professional domains: to assess substance use, to start treatment and to maintain treatment of patients with a substance use disorder. The AM-TNA is a paper and pencil questionnaire and completion of the questionnaire takes about 10 minutes.

2.4. Analyses

Respondents with missing values in the gender section (NL: 1 and Ire: 7) were excluded for analysis, while missing values in the age section were imputed through average value per country (Ire: 1). Because Lithuania only reported age categories, all other age data were subsequently transformed into the same age categories. In order to assess the overall psychometric value of the instrument, we required sufficient sample size for valid Explorative Factor Analysis (EFA) and the merged the 4-country data (raw data set: n=428, after cleaning and imputation: n=403). According to Matsunaga (2010), this sample size earns the qualification GOOD. Using descriptive statistics this merged dataset served to analyze demographics, including age and gender. The factor structure of the AM-TNA was analyzed through EFA. With 30 competencies/variables we opted to use the Kaiser's criterion (all factors with eigenvalues >1 retained) and, because factors are expected to be independent, a varimax rotation to maximize the dispersion of loadings within factors. Reliability was measured using Cronbach’s Alpha. Discriminant validity was established through analysis of variance (ANOVA), comparing training needs across all professionals. For analysis of normal distribution, we will apply the Z-test for skewness and kurtosis. SPSS, version 23, was used for the analyses.

The Helsinki ethical protocol was followed, informed consent established and ethical approval from participating institutions was secured (The Netherlands: Radboud University ECSW 2015-2508-33, Lithuania: Lietuvos Sveikatos Moklslu Universitas Nr BC-LSMU-121, Indonesia: Universitas Katolik Indonesia Atmajaja Jakarta Format J, October 2013, Ireland: UCD School of Medicine Health Science Centre, Dublin: Research Ethics Exemption Reference Number LS-E-15-113-Barry).

3.0. Results

3.1. Sample: a total of 428 respondents completed the AM-TNA (NL 118, Indo 104, Lit 70, Ire 136) questionnaire. The sample varied in discipline and level of AM education. The Dutch sample consisted of 5 psychiatric nurses, 2 psychologists, 16 psychiatrists, 21 psychiatrists in training, 30 addiction physicians, and 44 non-medical professionals working in SUD care, which did not receive any special post-graduate SUD training. The Indonesian sample consisted of 27 AM professionals joining the development of the first Indonesian AM curriculum: 1 psychiatric nurse, 6 GP's, 19 psychiatrists, 2 psychologists, and 5 non-specialist physicians and 77 GP's joining the first and second batch of the Indonesian Addiction Medicine Training (I-SCAN). Of the Lithuanian sample, all but 1 respondent were psychiatrists. The Irish sample consisted of 136 GPs in training, all in their 3rd and 4th year of postgraduate education. Respondents with missing values in the gender section (NL: 1 and Ire: 7) were excluded for analysis while missing values in the age section were imputed through average value per country (Ire:1). Because Lithuania only reported age categories, all other age data were subsequently transformed into the same age categories. Respondents with over 10% of missing values on the questionnaire (Indo: 1, Lit: 1, Ire: 23) were also excluded from the analysis. Because of the limited number missing values (<4 missing scores on the AM-TNA per respondent) (41) (Indo: 7, Lit: 3, Ire: 31) were imputed by hand, using the average score per item, per country. Resulting in a total of 403 respondents for analysis of the scores on the AM-TNA.

3.2. Demographics:

Registration for age and gender proved to be incomplete. As a result, over 4

countries, of the 428 respondents for age, 403 respondents and for gender 396 medical professionals respondents were included in the demographic analysis. Age categories: 30% of the respondents being younger than 30 years, 53% between 31-50 years and 19% older than 50 years, Gender: 68% being female. See Table 1 for further population details and comparison across countries.

- INSERT TABLE 1 ABOUT HERE -

3.3. Construct Validity:

The EFA (see Table 2) indicated that none of the items had to be removed: all factors were well above the standard exclusion criterion (being a loading <0.30 on either factor and a loading difference <0.15 between factors).

- INSERT TABLE 2. ABOUT HERE -

The Kaiser-Meyer-Olkin measure of .976 confirmed sample adequacy. Bartlett's test for sphericity was significant ($\chi 2$ 1.654E, df 435 P<.001), indicating that the interim correlations were adequate. This technique accounted for a cumulative 75.9% explained variance over two factors before rotation. After rotation, the two factors accounted for 44.6 and 33.3% variance respectively. Kaiser's criterion proved to be rather accurate ranging from .671-.867.

-INSERT TABLE 3. ABOUT HERE-

All 30 competencies loaded at correlations greater or equal to 0.50. As a result, all factor loadings were selected for inclusion (see Table 2). Items 1-12, 14, 15, 19-23, 25 and 29 loaded on Factor 1, which is best identified as *clinical* (providing direct patient treatment and care) AM competencies . Items 13, 16-18,24,26-28 and 30 loaded on Factor 2, which is best identified as *non-clinical* (facilitating/supporting direct patient treatment and care) AM competencies . Eight of top-ten training needs were in the non-clinical domain (Factor 2) and 2 were in the clinical AM competence domain (Factor 1).

3.4. Reliability

All 30 items, except item 15, 16, 23, 24, 26 and 28 were normally distributed (Z-test for Kurtosis Z=<0.005). Overall reliability proofed to be .986 (Cronbach's Alpha). The reliability of items loading on Factor 1 was .983 and for items loading on Factor 2 was .956.

3.5. Discriminative Validity

Country differences of training were measured. Both the Dutch addiction physicians and other AM professionals and the Lithuanian addiction psychiatrists mostly required training in the competence domain "*to start and to maintain treatment*", while Irish respondents, being GPs in training, tended to be less proficient in all competence domains, compared to the other countries.

There was a significant difference in mean scores per country on all 30 addiction medicine competencies (F 50.698-173.773, P= < .001). Seven of the 30 AM-TNA items: selecting appropriate screening/assessment tools for substance misuse (1.), using an evidence-based approach in assessment (7.), formulating a substance misuse disorder diagnosis according to DSM-IV (8.), developing a written treatment plan (10.), managing craving (16.), monitoring substance misuse patients for relapse during treatment (25.) and using group interventions effectively (26.) were in the overall top ten training needs across all professionals.

-INSERT TABLE 4. ABOUT HERE-

The post hoc multiple comparisons of the means per item overall professionals from each country to all countries confirmed professional differences: Dutch participants significantly differed from the other three countries in the sense that they scored all competencies higher. As illustrated by Table 4: range of the Dutch means was 4.22-4.69 while Indonesian, Lithuanian and Irish participants scored lower and did not significantly differ from each other as illustrated by the range of the means: Indonesian: 2.71-3.02, Lithuanian 2.10-3.57 and Irish 2.10-3.42.

4.0 Discussion

In our study, the AM-TNA documented *overall excellent reliability* (α=.986). The factor analyses revealed a *strong construct validity*: a clear and simple two-factor structure of clinical (Factor 1) and non-clinical (Factor 2) AM competencies and a cumulative 76% explained variance over two factors after rotation. The *discriminant validity* was sufficient: the instrument significantly differentiated training needs on all 30 addiction medicine competencies (P=.001) across professional from the four different countries.

The *reliability* proved to be excellent (total AM-TNA α=.986, Factor 1 α=.983 and Factor 2: α= .956): according to the minimum cut off score of .7 as regarded appropriate for ability tests (Field, 2013). Moreover this "high" value for alpha by no means implies that the instrument is one-dimensional as we discovered establishing the *construct validity.*

Construct validity: the EFA revealed a clear-cut two-dimensional factor structure explaining a cumulative 76% variance, which is quite good as an accepted cutoff point is around 60% (Hair, 2006). This two-factor structure makes sense because it is in accordance with a well-established concept of clinical vs. non-clinical competencies in medicine.

Also, the *discriminant validity* measuring differences in training need across the 4 countries proved to be satisfactory. The discriminant validity probably measured country differences based on a combination of a-prior professional disciplines, level of training and socio-cultural factors such as drug-use epidemiology and availability of addiction care. Our study was not meant and is by design unable to elaborate on the differences in training needs between countries, disciplines or training experiences or cultural context. Nevertheless, we found differences between the professionals when comparing across countries. In future research, one could tease out which factors actually contribute to the discriminant validity by comparing groups of AM professionals, which are more homogeneous.

Based on reliability, construct and discriminant validity, one can state that the AM-TNA has fairly good psychometric values to define precisely the training needs of different professionals on a standard set of 30 AM competencies.

It is of interest for a training curriculum that eight of top-ten training needs of all professionals were non-clinical: facilitating and supporting direct patient treatment and care AM competencies. Only two of the top-ten AM training needs were *clinical* (providing direct patient treatment and care) in the clinical domain. AM training needs in the non-clinical domain also seem to be positively related to the overall level of AM proficiency. Having the highest overall competence level, the Dutch AM professionals reported a need for training in five non-clinical competencies (item 13,16,18, 26,28) while the Irish GPs in-training, with the overall lowest level of AM proficiency, reported only one non-clinical competence (item 26).

Worldwide AM training varies substantially in content, level, and accreditation, while training needs assessment is rarely used to develop an AM curriculum (Ayu, 2015). Using the AM-TNA in the process of curriculum development has major benefits though: it will prioritize training needs, reveal weaknesses and strengths in addiction competencies of specific medical professionals and it will facilitate tailor-made AM training. Rationalization of medical specialist training, cost-effectiveness, trainees' motivation and potential clinical impact of tailored AM training also represent an important future area of research following directly from this AM-TNA study. The AM-TNA is indeed specifically designed for the development of a competence-based *medical addiction curriculum*, but disregarding typical medical competencies the instrument probably might be helpful to tailor *a non-medical addiction curriculum* aiming at oa. psychologists or pedagogues working in the addiction field.

Finally, results of an AM-TNA could also assist decision-making on the allocation of, often limited, training resources.

4.1. Study Limitations. Convenience sampling for psychometric evaluation with very different subsamples proved to be a suitable, pragmatic and inexpensive study approach. We realize that this method limits the generalizability of the results. To obtain more robust additional information such as years of education, years in practice, ethnicity, and religious backgrounds should be incorporated in future studies.

The AM-TNA measures self-reported perceptions of proficiency on specific AM competencies. Self-reporting of competencies by medical professionals correlates low with results of a validated objective assessment (Lai, 2011). This means that besides the AM-TNA additional corroborative assessments of training needs through objective instruments, supervisors and peers working in SUD care is advisable.

5. Conclusions

Our data show strong psychometric properties of the AM-TNA, construct validity, including reliability, and discriminant validity. The instrument has two domains: clinical and non-clinical competencies and differentiates well between different groups of professionals from various countries. The AM-TNA can be a valuable tool for tailoring training: designing and implementing AM training curricula, and prioritizing training needs for groups of trainees and help to close the "scientific knowledge - addiction treatment" gap. Future research should evaluate the instrument's capacity to re-test, measure changes in competencies over time and explore whether the AM-TNA can assist prioritizing allocation of limited available training resources. Furthermore, there is a need to test external validity, to strengthen discriminant validity and assess differences in AM training needs among professionals with different educational background. Last but not least: As long as the integrity of the instrument is respected and the authors are acknowledged the AM-TNA is an instrument that can be used for free. Please contact the first author to receive an updated version.

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5.2. Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Tables

Descriptive Statistics for Gender and Age (n and %) per Country								
	Gender		**Total**	**Age categories**				**Total**
Country	**Male**	**Female**		**=<30**	**31-40**	**41-50**	**>51**	
Netherlands	50/43%	67/57%	117	28/24%	24/22%	31/26%	33/28%	117
Indonesia	42/41%	61/59%	103	14/15%	49/48%	28/26%	12/11%	103
Lithuania	8/11%	61/89%	69	15/22%	17/24%	13/19%	24/35%	69
Ireland	25/23%	82/77%	107	63/55%	48/42%	2/2%	1/1%	114
Total	125/32%	271/68%	396	120/30%	138/34%	74/19%	69/17%	403

Table1. Overview of gender and age per country

Overview scoring on 30 professional competencies, means, standard deviations, and P-value Dutch, Indonesian, Lithuanian and Irish participants					
Competence	**Country comparison**				***p*-value**
	Mean Netherlands (SD) (*n* = 118	**Mean Indonesia (SD) (*n* = 103)**	**Mean Lithuania (SD) (n = 69)**	**Mean Ireland (SD) (n = 114)**	
Assessment and diagnosis					
1. Selecting appropriate screening/assessment tools for substance misuse	4.22 (.708)	2.79 (1.210)	2.88 (.978)	2.53 (1.015)	<.001
2. Screening risk of substance misuse problems	4.41 (.709)	2.97 (1.159)	3.00 (.907)	2.84 (.898)	<.001
3. Assessing substance misuse problems by taking a patient's history	4.62 (.506)	3.10 (1.089)	3.38 (.956)	3.42 (.786)	<.001
4. Assessing substance misuse problems by a physical examination	4.48 (.624)	2.91 (.930)	3.42 (.898)	2.97 (.926)	<.001
5. Selecting appropriate diagnostic laboratory tests	4.48 (.596)	2.92 (1.064)	3.17 (1.150)	2.99 (.907)	<.001
6. Interpreting substance misuse by screening, assessment, laboratory results	4.57 (.514)	3.03 (1.142)	3.17 (1.175)	2.88 (.894)	<.001
7. Using an evidence-based approach in assessment	4.38 (.680)	2.83 (1.133)	2.87 (1.013)	2.39 (.945)	<.001
Starting treatment					
8. Formulating a substance misuse disorder diagnosis according to DSM-IV	4.26 (.892)	2.85 (1.088)	3.57 (.947)	2.36 (1.090)	<.001
9. Explaining diagnosis, prevention and treatment plan to the patient	4.65 (.530)	3.11 (1.154)	3.16 (.949)	2.68 (.989)	<.001
10. Developing a written treatment plan	4.25 (.798)	2.92 (1.126)	2.67 (1.184)	2.39 (.992)	<.001
11. Selecting indicated initial treatment medications	4.69 (.499)	2.87 (1.169)	3.07 (1.019)	2.19 (.881)	<.001

12. Starting substitution and maintenance treatments	4.65 (.606)	2.69 (1.112)	2.90 (1.139)	1.96 (.872)	<.001
13. Providing general medical and social care to an addiction patient	4.37 (.651)	2.86 (1.010)	2.70 (.975)	2.89 (.938)	<.001.
14. Using evidence-based and up-to-date approaches in treatment	4.45 (.689)	2.81 (1.147)	2.70 (1.004)	2.20 (.874)	<.001
15. Using motivational techniques to support adherence to treatment	4.64 (.564)	3.05 (1.088)	2.51 (.901)	2.46 (.952)	<.001
16. Using basic psychosocial strategies to support recovery	4.38 (.614)	2.88 (1.149)	2.36 (.891)	2.58 (.911)	<.001
17. Consulting other medical professionals	4.44 (.579)	3.21 (1.006)	3.17 (.999)	3.23 (1.005)	<.001
18. Consulting non-medical professionals	4.26 (.697)	2.90 (1.098)	2.88 (1.037)	3.04 (1.034)	<.001
Managing treatment					
19. Selecting indicated maintenance and treatment medications	4.64 (.564)	2.81 (1.129)	2.84 (.918)	2.25 (.927)	<.001
20. Managing intoxication	4.68 (.585)	2.74 (1.129)	2.88 (1.022)	2.89 (.966)	<.001
21. Managing withdrawal	4.61 (.541)	2.71 (1.160)	3.17 (1.014)	2.89 (.916)	<.001
22. Managing craving	4.63 (.551)	2.72 (1.158)	2.62 (1.030)	2.32 (.847)	<.001
23. Managing overdoses	4.59 (.709)	2.73 (1.206)	2.35 (1.069)	2.76 (.905)	<.001
24. Managing medical emergencies	4.44 (.814)	3.02 (1.102)	2.46 (1.145)	3.28 (.857)	<.001

25. Monitoring substance misuse patients for relapse during treatment	4.32 (.665)	2.82 (1.127)	2.64 (.923)	2.56 (.903)	<.001
26. Using group interventions effectively	3.99 (.825)	2.72 (1.115)	2.10 (.942)	2.10 (.830)	<.001
27. Collaborating with other medical professionals	4.55 (.594)	3.12 (1.022)	2.84 (.918)	3.20 (.894)	<.001
28. Collaborating with non-medical professionals	4.33 (.682)	3.00 (1.029)	2.65 (.888)	3.05 (.939)	<.001
29. Distinguishing substance misuse disorders from co-occurring psychiatric disorders	4.66 (.528)	2.86 (1.076)	2.93 (.944)	2.77 (.8420	<.001
30. Addressing additional psychological and psychiatric disorders	4.57 (.546)	2.84 (1.06)	3.06 (.968)	3.02 (.776)	<.001

Table 2 Overview, means, SD and P-value of 30 competencies over 4 countries

Total Explained Variance over two Components

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% Variance	% Cumulative	Total	% Variance	% Cumulative	Total	% Variance	% Cumulative
1	21.534	71.779	71.779	21.534	71.779	71.779	13.389	44.631	44.631
2	1.237	4.122	75.901	1.237	4.122	75.901	9.381	31.270	75.901

Table 3. Total explained variance over two components

Factor loading AM-TNA		
Items factor 1	**Loading Factor 1**	**Loading Factor 2**
1. Selecting appropriate screening/assessment tools for substance use	.731	.372
2. Screening risk of substance use problems	.726	.437
3. Assessing substance use problems by taking a patients history	.687	.479
4. Assessing substance use problems by a physical examination	.734	.412
5. Selecting appropriate diagnostic laboratory tests	.677	.469
6. Interpreting substance use by screening, assessment, and laboratory results	.736	.430
7. Using an evidence-based approach in assessment	.768	.431
8. Formulating a SUD diagnosis according to DSM-IV	.806	.381
9. Explaining diagnosis, prevention and treatment plan to the patient	.770	.442
10. Developing a written treatment plan	.719	.442
11. Selecting indicated initial treatment medications	.850	.374
12. Starting maintenance and substitution treatment	.818	.387
14. Using evidence-based and up-to-date approach in treatment	.741	.495
15. Using motivational techniques to support adherence to treatment	.664	.562

19. Selecting indicated maintenance and treatment medications	.780	.477
20. Managing intoxication	.735	.471
21. Managing withdrawal	.751	.468
22. Managing craving	.745	.487
23. Managing overdoses	.643	.562
25. Monitoring substance use patients for relapse during treatment	.682	.576
29. Distinguishing SUD co-occurring psychiatric disorders	.651	.605
Items Factor 2		
13. Providing general medical and social care to addiction patient	.528	.655
16. Using basic psychosocial strategies to support recovery	.604	.640
17. Consulting other medical professionals	.378	.817
18. Consulting non-medical professionals	.347	.840
24. Managing medical emergencies	.461	.608
26. Using groups interventions effectively	.563	.595

27. Collaborating with other medical professionals	.399	.841
28. Collaborating with non-medical professionals	.347	.869
30. Addressing additional psychological and psychiatric	.548	.665

Table 4. Factor loadings of the exploratory factor analysis (EFA) of the final 30-item version of the Addiction Medicine Training Need Assessment Scale (AM-TNA)