MEASURING DRUG USE FOR PREDICTION AND PREVENTION IN MOROCCAN HIGH RISK AND GENERAL POPULATION SAMPLES

ANIS SFENDLA

Measuring drug use for prediction and prevention in Moroccan high risk and general population samples

Anis SFENDLA

University Abdelmalek Essaâdi
Faculty of Sciences
Tétouan, Morocco

UNIVERSITY ABDELMALEK ESSAADI
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Friends show their love in times of trouble, not in happiness.

- Euripides

All that I am, or hope to be, I owe to my angel mother.

- Abraham Lincoln

No legacy is so rich as honesty.

- William Shakespeare

Abstract

Background: In order to be able to participate in international research there is a rising need for valid and reliable instruments assessing drug-related problems in the Arab world. These problems are manifold and are linked to societal as well as interpersonal factors.

Aim: The aims of this thesis were to (1) develop the translated Arabic version of the Drug Use Identification Test (DUDIT) and evaluate its psychometric properties; (2) investigate risk and protective factors of drug dependence based on DUDIT as a screening tool; and (3) study the effect of parental alcohol abuse on their adolescent children's aggressive behavior and eventual somatic complaints.

Subjects & Methods: Data was retrieved from an ongoing international study, the "Mental and Somatic Health without boarders" (MeSHe) study in which we participated by the present work that assesses somatic and mental health parameters by anonymous self-reports from prison inmates (n=177), outpatients from an addiction institution (n=72), and high school students (n=280). The assessment was based on a set of questionnaires including sociodemographic, medical history, DUDIT, and Life History of Aggression (LHA). IBM SPSS 21 was used to assure the statistical analysis.

Results: The Arabic version of DUDIT validation revealed, by the use of principal factor analysis, the presence of only one factor, which explained 66.9 percent of the variance. Internal reliability was excellent (Cronbach's alpha = .95). When compared to the DSM-IV substance use disorder diagnosis in a clinical sample, the Arabic DUDIT had high predictive validity (area under the curve (AUC) of .98). The combined maximal sensitivity and specificity (.98 and .90, respectively) of the Arabic DUDIT was found at the cutoff score of 3 points, which can be used to identify individuals with drug dependence in Arab-speaking countries. We have used this validated cutoff to identify 'Dependent' and 'Non-dependent' individuals in high-risk samples with the aim to study protective and risk factors of drug dependence. The results of multivariable regression models confirmed that higher level of education, having a child, and being employed are protective factors from drug dependence even in the presence of psychiatric problems, while the presence of depression remains a significant risk factor for being drug dependent. Finally, our studies showed that parental alcohol abuse affects adolescent children, who report increased aggressive behavior and higher frequency of migraine and headaches than those adolescents who are not living with parents who have alcohol-use problems.

Conclusion: The Arabic DUDIT represents a valid and reliable drug-use screening tool in Arab-speaking countries, with a specific cutoff for identifying individuals with drug dependence for these countries. Efforts have to focus on increasing academic competence and treating depression in high-risk populations to prevent the persistence of drug dependence. Finally, medical and social support should focus not only on addicted individuals themselves, but also investigate the need of support and care for their family members, particularly their children.

Résumé

Contexte : Afin de rejoindre le contexte international de la recherche et la science, il existe un besoin croissant d'instruments valides et fiables pour évaluer les problèmes liés à la drogue dans le monde arabe. Ces problèmes résultent d'une multitude de facteurs aussi bien d'ordre sociétal qu'interpersonnel.

Objectif : Les objectifs de cette thèse de doctorat sont : (1) développer une version arabe du Drug Use Disorders Identification Test (DUDIT) par traduction de la version originale en anglais et évaluer ses propriétés psychométriques (2) Identifier les facteurs de risque et de protection liés à la toxicomanie en utilisant le test DUDIT comme outil de dépistage (3) Etudier l'effet d'abus d'alcool chez les parents sur le comportement, l'agressivité et les plaintes somatiques chez leurs enfants adolescents.

Matériel et Méthodes : Les données ont été extraites d'une étude internationale en cours « Santé mentale et somatique sans frontières (MeSHe) » à laquelle nous avons participé par les travaux présentés ici et qui correspondent à l'évaluation des paramètres de la santé mentale et somatique par des auto-évaluations anonymes chez un groupe de détenus (n = 177), de patients externes d'un établissement de traitement de la toxicomanie (n = 72) et d'élèves (n = 280). Nous avons utilisé une batterie de questionnaires : partie socio-demographique, antécédents médicaux, le DUDIT et le *Life History of Aggression* (LHA). Le traitement des données a été réalisé par IBM-SPSS 21

Résultats : L'évaluation de la validité de la version arabe du DUDIT, via l'analyse factorielle principale, a mis en évidence l'existence d'un seul facteur expliquant 66,9% de la variance. Sa fiabilité interne est excellente (alpha de Cronbach = 0,95). Les résultats relatifs à la comparaison du DUDIT au diagnostic de troubles liés à l'utilisation de substances (DSM-IV), avec un seuil de (> = 3 points), montraient que la version arabe du DUDIT avait une validité prédictive élevée (aire sous la courbe (ASC) de 0,98), une sensibilité (0,98) et une spécificité élevées (0,90) pour l'identification des personnes dépendantes de l'usage de drogues. L'identification des facteurs de risque et de protection de la pharmacodépendance reposait sur l'utilisation du seuil validé «Groupe dépendant» versus «Groupe non dépendant ». Via les modèles de régression multivariée, nous avons pu montrer qu'un niveau de scolarité plus élevé, avoir un enfant et être employé constituaient des facteurs de protection contre la toxicomanie, alors que, la présence de dépression en représentait un facteur de risque. Enfin, l'abus d'alcool par les parents avait un effet sur le comportement et l'agressivité des enfants adolescents qui présentaient un comportement plus agressif et une fréquence de plaintes somatiques plus élevée comparés aux enfants adolescents qui vivaient avec des parents non dépendants.

Conclusion : La version arabe de DUDIT représente un outil de dépistage de la toxicomanie valide et fiable dans les pays arabes. Les efforts doivent se concentrer sur l'augmentation des compétences académiques et le traitement de la dépression dans la population à haut risque pour la prévention de l'addiction et la pharmacodépendance. Par ailleurs, les soutiens

médicaux et sociaux ne devraient pas se limiter aux personnes dépendantes mais également inclure leur entourage.

Mots-clés: Etude MeSHe, pharmacodépendance, comportement agressif, DUDIT, propriétés psychométriques, facteurs de protection, facteurs de risque.

ملخص

بهدف الانضمام إلى البحوث والعلوم الدولية هناك حاجة متزايدة إلى أداة صالحة وموثوق بها لتقييم المشاكل المتعلقة بالمخدرات في العالم العربي. هذه المشاكل تظهر في أصول متعددة وترتبط بعدة عوامل مجتمعية وشخصية. تهدف هذه الأطروحة إلى (1) استخراج الخصائص السيكومترية لاختبار تحديد تعاطي المخدرات DUDIT، (2) التحقيق في عوامل الخطر والوقاية من إدمان المخدرات على أساس DUDIT كأداة فحص، و (3) دراسة تأثير استهلاك الآباء للكحول على السلوك العدواني للأطفال المراهقين والشكاوى الجسدية الناتجة عن ذلك.

تمت ترجمة الأداة من اللغة الإنجليزية إلى اللغة العربية، وعرضه على مجموعة من الاختصاصيين في اللغة العربية للتأكد من سلامة الصياغة، ليتم بعدها إجراء ترجمة مضادة إلى اللغة الأصلية (الإنجليزية)، للتأكد من دقة الترجمة. وقد تم استرجاع البيانات من دراسة دولية مستمرة، وهي "دراسة الصحة العقلية والجسدية دون حدود" (MeSHe). تضم الدراسة عينات عشوائية مختلفة تتكون من سجناء (عدد = 177)، عينة سريرية من مرضى خارجيين تابعين لمؤسسة إدمان (عدد = 72)، إضافة إلى عينة من الطلبة (عدد = 280). ويقيم المسح معايير الصحة الجسدية والعقلية عن طريق التقارير الذاتية المجهولة من هذه العينات.

توصلت الدراسة إلى مجموعة من النتائج تشير إلى مستوى عال من الصدق تتمتع به النسخة العربية من لاختبار تحديد تعاطي المخدرات DUDIT، تبين من خلال استخدام تحليل العامل الرئيسي، وجود عامل واحد فقط، وهو ما شرح 66.9% من التباين بينما كانت الموثوقية الداخلية ممتازة (ألفا كرونباخ = 0.95).

بالمقارنة مع الدليل التشخيصي الإحصائي للاضطرابات العقلية DSM-IV في عينة سريرية، كان لنسخة العربية من إختبار تحديد تعاطي المخدرات DUDIT صحة تنبؤ عالية (المنطقة تحت المنحنى (AUC)= 0.98)؛ تم الجمع بين أعلى حساسية وخصوصية (0.98 و 0.90 على التوالي) الموازية لعتبة (3≥نقاط) كمقياس لتحديد إدمان المخدرات لنسخة العربية من إختبار تحديد تعاطي المخدراتDUDIT . عند دراسة عوامل الوقاية والمخاطر من الإدمان على المخدرات، استنادا إلى العتبة الموازية لتحديد الإدمان تم تحديد مجموعتين "مجموعة المدمنين" و "مجموعة غير المدمنين". تبينة (بمساعدة نماذج الانحدار متعددة المتغيرات) أن مستوى تعليمي أعلى، وجود طفل، والتوفر على عمل هي عوامل وقائية من الادمان على المخدرات حتى في وجود مشاكل نفسية، في حين أن تشخيص بالاكتئاب يعتبر عامل خطر للإدمان. أخيرا، فإن تعاطي الكحول عند الآباء له تأثير على أطفالهم المراهقين الذين يظهرون سلوكا عدوانيا متزايدا ولشكاوي الجسدية أعلى من المراهقين الذين لا يعيشون مع آباء مدمنين.

النسخة العربية من DUDIT تمثل أداة موثوقة لإستخدامها في البلدان الناطقة باللغة العربية. وعليه فإن الجهود يجب أن تركز على زيادة الكفاءة الأكاديمية ومعالجة الاكتئاب في السكان المعرضين لمخاطر شديدة والوقاية من استمرار الإدمان على المخدرات. وأخيرا، ينبغي أن يركز الدعم الطبي والاجتماعي ليس فقط على الأفراد المدمنين أنفسهم، ولكن تحقيق الدعم والرعاية لأفراد أسرهم وأطفالهم.

كلمات البحث: المراهقين السلوك العدواني عينة سريريه، الاكتئاب إدمان المخدرات اختبار تحديد تعاطي المخدرات DUDIT ، النزلاء دراسة MeSHe، عوامل وقائية، الخصائص النفسية عوامل الخطر.

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At the end, I wanted to say one final thank you for the honor of being a PhD student, since all that I've learned in my time as a graduate, I have learned from all of you. You made me a better student, and you made me a better man.

List of papers

The following thesis allowed for four publications, referred consequently in the text by their roman numeral and two scientific meeting participations.

I. **Sfendla A**, Zouini B, Lemrani D, Berman AH, Senhaji M, Kerekes N.: Psychometric Properties of the Arabic Version of the Drug Use Disorders Identification Test (DUDIT) in Clinical, Prison Inmate, and Student Samples. *Int J Behav Med*. **2017**:1-8. doi:10.1007/s12529-016-9623-2**.** (Paper I; Appendix 1 and 2)

II. **Sfendla A**, Ahlström BH, Lemrani D, Senhaji M, Kerekes N.: Risk and protective factors of drug dependence in high-risk male populations **(Submitted)**.

III. Zouini B, **Sfendla A**, Senhaji M, Kerekes N.: Aggressive antisocial behavior and its relation to the experience of abuse or the experience of parental alcohol problems **(Submitted)**.

IV. Zouini B, **Sfendla A**, Senhaji M, Kerekes N.: The impact of abuse and alcoholism on Moroccan adolescents **(Submitted)**.

Sfendla A, Senhaji M, Kerekes N., "**Drug Addiction in Morocco: Reliability and validity of DUDIT Drug Use Disorder Identification Test**" at **JR18 UAE** 18th Research Day of the University Abdelmalek Essaâdi, National School of Commerce and Management of Tangier **(**Oral presentation**).**

Zouini B, **Sfendla A,** Senhaji M, Kerekes N., "**Aggressive behavior and somatic problems in Moroccan students reporting abuse and alcoholism in their home".** 6th Mediterranean Neuroscience Society conference 2017, Malta MNS 2017 (poster)

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ABBREVIATIONS

The following Abbreviations have been used in this thesis:

AHSUD :	Association Hasnouna for Drug Users Support
AAB :	Aggressive Antisocial Behavior
ASI :	Addiction Severity Index
ASSIST :	Alcohol, Smoking and Substance Involvement Screening Test
AUC :	Area Under the Curve
AUDIT :	Alcohol Use Disorders Identification Test
CAGE-AID :	Cut-down, Annoyed, Guilty, Eye-opener – Adapted to Include Drugs
COSMIN :	Consensus-based Standards for the selection of health Measurement Instruments
CG	Comparison Group
CTT :	Classical Test Theory
DALYs :	Disability-Adjusted Life Years
DAST :	Drug Abuse Screening Test
DSM :	Diagnostic and Statistical Manual of Mental Disorders
DSM- R :	Diagnostic and Statistical Manual of Mental Disorders – Revised
DUDIT :	Drug Use Disorders Identification Test
HR-PRO :	Health-Related Patient-Reported Outcomes
ICD :	International Classification of Diseases
IRC :	Item-Rest Correlations
IRT :	Item Response Theory
LHA :	Life History of Aggression
LTEQ :	Godin Leisure-Time Exercise Questionnaire
MDMA :	Methylenedioxymethamphetamine
MeSHe :	Mental and Somatic Health without borders
NGO :	Non-Governmental Organizations
PAF :	Principal Axis Factoring
PANAS :	Positive Affect and Negative Affect Schedule Expanded
PAP	Adolescents reporting Parental Alcohol use Problems
ROC :	Receiver Operation Characteristics
SUD :	Substance Use Disorder
TCI :	Temperament and Character Inventory
WHO :	World Health Organization

DEFINITIONS IN SHORT

Addiction – a disease that is characterized by impaired control over use of a substance, preoccupation with a substance, use of a substance despite adverse consequences, and distortions in thinking (Morse & Flavin, 1992).

Screening – a formal process of testing to determine whether a client warrants further attention at the current time for a particular disorder and that investigates the possibility of the existence of a co-occurring disorder. The screening process does not necessarily identify what kind of problem the person might have or how serious it might be, but determines whether further assessment is required (Sacks & Ries, 2005).

Substance abuse – defined in DSM-IV-TR as a maladaptive pattern of substance use manifested by recurrent and significant adverse consequences related to the repeated use of substances. Sometimes used interchangeably with the term substance dependence (American Psychiatric Association, 2000).

Substance abuse treatment program – an organized array of services and interventions with the primary focus on treating substance use disorders, providing both acute stabilization and ongoing treatment (Sacks & Ries, 2005).

Substance dependence – a maladaptive pattern of substance use leading to clinically significant impairment or distress, as manifested by a need for increasing amounts of the substance to achieve intoxication, markedly diminished effect of the substance with continued use, the need to continue to take the substance in order to avoid withdrawal symptoms, and other serious behavioral effects, occurring at any time in the same 12-month period (American Psychiatric Association, 2000).

Substance use disorder – a class of substance-related disorders that includes both substance abuse and substance dependence (American Psychiatric Association, 2000).

Contents

1 .Introduction

The problem of substance use has become a worldwide burden that affects not only individuals' health and well-being, but also society's economic development and environmental sustainability. Substance use has a wide range of direct and indirect effects; it can cause long-term or even life-long negative outcomes through various mechanisms in a person's physical and mental health state, and can initiate destructive behaviors. Today, substance use accounts for more death, illness, and disabilities than any other treatable health condition (De Wit, 2009; National Institute on Drug Abuse, 2017).

The epidemiological status of drug use in Morocco showed a transition from traditional cannabis use to newly administered drugs that carry the potential risk of transmitted diseases infections. The newly screened drugs could relate to the generation-transition pattern of use as well as to the geographical situation of the country, closely located to European countries. The Moroccan Health Ministry has implemented various strategies related to mental health, particularly drug use and addiction. The main objectives were reducing drug demand, treating patients with addiction, and decreasing the risk associated with injected drug use (Himmich & Madani, 2016; International Narcotics Control Board, 2014).

This thesis aims to translate to Arabic the English version of Drug Use Disorders Identification Test (DUDIT), an internationally used drug-screening instrument and to investigate its psychometric properties as a first step,, and then, with the help of this instrument, to identify potential risk and protecting factors of substance dependence in high-risk Moroccan samples. Moreover, we aim to reveal the indirect societal consequences of addiction by investigating how addicts' adolescent children feel.

1.1 Substance abuse statistics

The worldwide prevalence of drug abuse in 2014 reached 5.2 percent, reflected by 247 million people who had used drugs during the previous year, with nearly 29 million people (12 percent of those who use drugs) suffering from substance use disorder (SUD) (United Nations Office on Drugs and Crime (UNODC), 2016). An increasing trend in drug use has been noticed in developing countries, with cannabis as the primary drug of abuse followed by amphetamine-type stimulants, ecstasy (that is, MDMA), and opium derivatives (International Narcotics Control Board, 2014; Odejide, 2006). Generally, the amount of health lost due to drug and alcohol use is higher in low- and middle-income countries than those in high-income

countries. For example, drug use disorders in low-income countries account for a loss of 6.5 Disability-Adjusted Life Years (DALYs), compared to the loss of 1.9 (DALYs) in high-income countries (Collins *et al*., 2011). Within the Mediterranean region, drug use disorders account for a loss of 4 DALYs, compared to the loss of 2 DALYs globally (World Health Organization, 2010). Morocco is considered one of the main producers of cannabis resin worldwide, which makes the concern over the health and societal effects of drug use highly relevant (International Narcotics Control Board, 2005). The prevalence of drug use observed in Morocco – particularly in adult samples – was consistent with global numbers (Kadri *et al*., 2010). However, the prevalence of disorders related to substance use was 5.8 percent among the adult Moroccan general population, which is considered several times higher than the prevalence of drug use disorders in developed countries (Demyttenaere *et al.,* 2004; Merikangas & McClair, 2012). In Moroccan adolescent populations (15–17 age groups), the primary substance of abuse is tobacco (boys 20 percent, girls 6 percent), followed by alcohol (boys 7.6 percent, girls 2.8 percent), cannabis (boys 9.5 percent girls 2.1 percent), and psychotropic substances (4.4% among both genders) (National Observatory on Drugs and Addiction, 2014). It should be noted that according to worldwide estimates, only one in six addicts received treatment (United Nations Office on Drugs and Crime (UNODC), 2016). Available treatment programs of SUD are one of the major contributors to healthcare costs, both as a single diagnosis and as a comorbid condition (with other diagnoses). From a monetary point of view, the implementations of drug policies – for direct and indirect drug-related problems – costs between 0.07 percent and 1.7 percent of a country's gross domestic product (GDP). For instance, the average cost of one year of methadone maintenance treatment in Morocco costs approximately $1200 per patient, whereas the annual cost of crimes attributed to illicit substances abuse was estimated to be $780 billion (Cartwright, 2008; National Institute on Drug Abuse, 2015).

1.2 Concepts of substance abuse, dependence, and classification of substance use disorder

Substance abuse includes the harmful and hazardous use of psychoactive substances, alcohol, and illicit drugs. Dependence syndrome – a cluster of behavioral, cognitive, and physiological phenomena – can be a consequence of repeated substance use, including a strong urge to take the drug, difficulties in controlling its use, persisting in the use despite harmful consequences,

higher priority given to drug use than to other tasks and obligations, increased tolerance, and sometimes a physical withdrawal state (World Health Organization, 2016).

Substance dependence has been defined in both classification systems (Diagnostic and Statistical Manual of Mental Disorders (DSM) & International Classification of Diseases (ICD)) as physiological, behavioral, and cognitive phenomena that lead to loss of control over use. Various criteria have to be fulfilled for a diagnosis of dependence, and these criteria are the same for all psychoactive substances (American Psychiatric Association, 1994; World Health Organization, 1993).

Substance use disorder (SUD) is a more recent concept; it was first published in DSM-5 (Fifth version, 2013), replacing previous concepts of substance abuse and substance dependence. SUD refers to the use of one or more substances leading to clinically significant impairment or distress (American Psychiatric Association, 2013).

Being able to measure symptoms coupled with substance use and abuse is the basis for being able to manage acute problems, to develop effective treatment strategies, and even to spread preventive sanctions. Two major nomenclatures have defined SUD: (1) the DSM, developed by the American Psychiatric Association, and (2) the ICD, developed by the World Health Organization (WHO). The present thesis follows the DSM criteria of SUD.

Historically, different traditions have explained psychoactive substances and their effects, going from the perception that substance use reflects a disease process to the conceptualization of drug use (including excessive alcohol use) as a failure in moral and character (Dodes, 1990; Gordis, 1997). The influence of psychoanalysis and psychosocial model was evidenced within the first published edition of DSM (DSM-I); addiction problems (that is, drug addiction and alcoholism) were characterized as arising from a personality disorder (American Psychiatric Association, 1952). Drug addiction was not fully defined; the labeled diagnosis was "*Addiction is usually symptomatic of a personality disorder. The proper personality classification is to be made as an additional diagnosis*". These years drug addiction and alcoholism were considered as the consequences of a personality disorder and were most often set as secondary diagnoses, following the primary diagnosis of a personality disorder (American Psychiatric Association, 1952). In 1965, the American Medical Association recognized alcoholism and its severity as a medical disorder, emphasizing the need for a medical model-based classification system.

DSM-II incorporated some small changes compared to DSM-I (partly based on the influence of psychoanalysis) in the description of diagnoses and it was the first which separated alcoholism and drug addiction, accepting them as primary diagnoses "*even when they began as a symptomatic expression of another disorder*". While no specific definitions and criteria were cited, the text stated that "*the best direct evidence for alcoholism is the appearance of withdrawal symptoms*", and that drug dependence required "*evidence of habitual use or a clear sense of a need for the drug*" (American Psychiatric Association, 1968).

DSM-III (American Psychiatric Association, 1980) considered as a turning point in psychiatry, where the taken modifications constituted a major breakthrough shifting from psychoanalytic tradition to consensus-based diagnoses, and consequently marked the appearance of the multiaxial system (Wilson, 1993). The major change made by DSM-III was based on the tradition that saw substance use as a disease process, and was influenced by Jellinek's (1960) diagnostic attempts to classify alcoholism. In DSM-III a dichotomous categorization was used, distinguishing between substance abuse and substance dependence. While substance abuse was defined in terms of the pathological use of a substance, which had social or occupational consequences (including legal problems); substance dependence which require one of these domains as well as tolerance and withdrawal.

A revised version of DSM-III (DSM-III-R, 1987) included minor revisions in order to clarify inconsistencies and ambiguities of the previous DSM. In DSM-III-TR, dependence syndrome was the one that formed the core of classification of different psychoactive substance use disorders. The most important changes occurred in the diagnostic criteria of substance abuse and dependence. Fulfilling 3 out of 7 criteria [(1) Taking substance in large amount or over longer period than intended, (2) Persistent desire or unsuccessful efforts to cut down or control use, (3) Spending a great deal of time to get or use the substance, or recover from it after effects, (4) Frequent intoxication or withdrawal when expected to fulfill major obligations, (5) Giving up activities for substance use, (6) Continuing to use despite problems, (7) Using substance to relieve or avoid withdrawal symptoms] was required for the diagnosis of dependence. The elimination of the criteria about tolerance and withdrawal reflects the recognition in medical science that dependence is mostly caused by the loss of control and compulsive use of alcohol/drugs, which consequently lead to psychological, physical, and social consequences. Substance abuse was defined by hazardous use of alcohol/drugs despite the negative consequences and was emphasized that the person cannot fulfill criteria of dependence.

The biaxial concept (Edwards, 1986) adopted in DSM-IV (American Psychiatric Association, 1994) still distinguished between substance dependence (impaired control over use, withdrawal, and dependence) and substance abuse (social, legal problems, hazardous use, driving under influence). The criteria followed the previous ones in DSM-III-TR, covering both physiological and psychosocial aspects, with a slightly higher threshold for substance dependence than for substance abuse (Robinson & Adinoff, 2016). Substance abuse – representing a less severe condition than dependence – was defined as repeated substance use leading to one or more social or occupational problems. Criteria for substance abuse included at least one of the following: hazardous use elevating the risk of physical harm, significant clinical impairments or distress, use despite social and interpersonal problems, and use despite legal problems. The co-existence of both diagnoses at the same time was unattainable, since substance abuse was followed by the more severe diagnosis of substance dependence. The extent to which the hierarchical relationship of abuse and dependence is applied remained a controversy (Nelson *et al.,* 1999; World Health Organization, 1981).

The most recent version of DSM (DSM-V, 2013) included the most substantial modifications since DSM-III. It has now completely diminished the abuse-dependence concept and replaced it with a single unified category, substance use disorders that cover substance abuse and dependence as spectrum of the same psychiatric condition. Criteria of this new diagnosis is measured on a continuous symptom-scale there 2–3 symptoms referred to as mild, 4–5 symptoms as moderate and 6 or more symptoms (out of 11 total symptom) as severe conditions (American Psychiatric Association, 2013).

1.3 Screening tools and their psychometric properties

1.3.1 Screening diagnostic approaches

The early identification of individuals with drug problems and evaluation of treatment strategies requires valid and reliable screening instruments. Alongside various practical diagnoses approaches that allow assessment from a systematic structured interview, such as the Composite International Diagnostic Interview (Wittchen & Nelson, 1996), the Diagnostic Interview Schedule (Segal & L., 2010), and the Schedules for Clinical Assessment in Neuropsychiatry (Hurwitz, 1996), brief screening instruments are also well recognized and validated empirically and cross-culturally (Ustün *et al*., 1997); they are available to aid in the identification of alcohol and drug use problems in a primary care setting. Several of these

instruments have focused on substance use (Carey, 2002; Sobell *et al.*, 1994). Some of the most frequently used instruments for these purposes are the Drug Abuse Screening Test (DAST) (Skinner, 1982); the Cut-down, Annoyed, Guilty, Eye-opener – Adapted to Include Drugs (CAGE-AID) (Brown & Rounds, 1995); and the Drug Use Disorders Identification Test (DUDIT) (Berman *et al.*, 2004). The latter is one of the newest members in the list of screening instruments, and was developed with the specific aims of assessing usage patterns and related problems as well as identifying the risk of harmful use or dependence according to DSM-IV and ICD-10.

1.3.2   Drug Use Disorder Identification Test DUDIT

The DUDIT has been used mainly in European countries, such as Sweden – where it was created – (Durbeej *et al.*, 2014; Sinadinovic *et al.*, 2011), Norway (Lobmaier *et al.*, 2013; Nesvåg *et al.*, 2010), Hungary (Matuszka *et al.*, 2014), and the Netherlands (Hildebrand & Noteborn, 2015; Hillege *et al.*, 2010). However, its use also spread outside Europe, being used in the United States (Reddy *et al.*, 2014; Voluse *et al.*, 2012), South Africa (Martin *et al.*, 2014), Turkey (Evren *et al.*, 2013; Evren *et al.*, 2014), and Morocco (Sfendla *et al.*, 2017) (Paper I). DUDIT showed good psychometric properties (Berman *et al.*, 2004) and confirmed its validity in assessing drug-related risk behavior and/or addiction in various samples. These samples include the general population (Evren *et al.*, 2013; Matuszka *et al.*, 2014; Voluse *et al.*, 2012), prisoners (Berman *et al.*, 2004), probationers (Hildebrand & Noteborn, 2015), offenders with mental health problems (Durbeej *et al.*, 2014), patients with SUD (Landheim *et al.*, 2006) or with a diagnosis of psychosis (Nesvåg *et al.*, 2010), and in samples of adolescents and school-attending youths (Hillege *et al.*, 2010; Martin *et al.*, 2014).

1.3.3   Psychometric properties of screening tools

In psychometrics, two general approaches are adopted: (1) the Classical Test Theory (CTT), and a modern one, (2) the Item Response Theory (IRT). Classical Test Theory evaluates difficulty level and individual performance in taking the test and reliability focuses on how the observed score reflects the true score of interest, while Item Response Theory focuses on items as a scale and how test items assess the constructs; it concerns the development of test items and accurate test scoring. IRT models have been used to analyze various types of data (for example, binary test items or ordinal Likert-scales) in psychological assessments (An & Yung, 2014; Machin & Fayers, 2013).

Many researchers in behavioral studies rely on self-report measurements, even though these measures have well-known biases; nevertheless, no other alternative mean of measurements for specific subjective constructs (pain, depression, addiction, life satisfaction, quality of life, etc.) are available (Kimberlin & Winterstein, 2008). Information is retrieved by the self-reported questions or, in other cases, via interviews. In most cases, participants are required to provide their own perception about the frequency of a specific behavior or affect using defined response alternatives (ordinal scales). These measurements help to assess and quantify phenomena known as theoretical constructs, while the quality of these measurements is reflected by reliability and validity. Measurement consists of construct operationalization in defined variables, then development and application to quantify these tests/instruments – a concept known as *descending the ladder of abstraction*. Such concept helps moving from the abstract to the concrete; when clarifying a concept, a chained ladder process is initiated, where dimensions are specified and, consequently, sub-dimensions are sub-divided (De Vause, 2002). Contrary to the measures developed from patients' information, medical records are considered to be objective (for example, laboratory tests), since these tests have a known error margin and have undergone rigorous evaluation regarding reliability and validity.

Multi-items tests theory is based on measurement models making various assumptions about items' nature, and forms what is called *traditional psychometrics* based on linear model such as factor analysis or summed scales (Machin & Fayers, 2013). It is mandatory to control for measurement error, check if it measures the concept intended to be measured (validity), and ensure that it reflects a reliable measurement on different occasions (reliability) (Kimberlin & Winterstein, 2008).

Measurement should satisfy a norm of properties. These properties include reliability, repeatability, validity, sensitivity, and responsiveness. Instrument validation represents the process of determining whether the instrument is measuring what it is intended to measure, and focuses on reducing error in the measurement process. The validation process goes through various stages where it has to present strong evidence that the instruments taps into the construct that it intends to measure (Kimberlin & Winterstein, 2008; Machin & Fayers, 2013).

In summary, the taxonomy of the psychometric properties of an instrument can be divided into three main groups: reliability, validity, and responsiveness. Reliability includes stability, internal consistency, and inter-rater reliability; validity can be framed into three main aspects

(content validity, criterion validity, and construct validity), and responsiveness reflects overtime changes in the contrast of interest detected by the measure (Mokkink *et al*., 2010). In the following section, we focus on a more detailed discussion on reliability and validity estimates.

1.3.3.1   Reliability estimates

Various means are available to estimate the reliability of a measure. Reliability estimates help to appraise the equivalence of items in a measure (internal consistency); to evaluate measures' stability during repeated use among the same individuals (test-retest reliability); or when different raters score a behavior or an event (inter-rater reliability). Reliability coefficients range from zero to one, where higher coefficients indicates higher reliability (Kimberlin & Winterstein, 2008). A consensus was reached on the taxonomy and terminology of measurement's reliability as "*The degree to which the measurement is free from measurement error*" (Mokkink *et al*., 2010)*, or in an extended definition, *"The extent to which scores for patients who have not changed are the same for repeated measurement under several conditions: for example, using different sets of items from the same HR-PROs health-related patient-reported outcomes (internal consistency), over time (test-retest) by different persons on the same occasion (inter-rater) or by the same persons (i.e., raters or responders) on different occasions (intra-rater)*" (Mokkink *et al*., 2010).

(a) Internal consistency measures the coherence and homogeneity of items in the same scale (for example, items aimed to assess the severity of drug use). The coefficient calculated yields an estimate of reliability and based on the hypothesis that strong correlations (coefficient close to one) should be found between items assessing the same construct. The most widely used method is to present Cronbach's alpha coefficient estimating the average inter-correlations of items used for summed scales (Cortina, 1993; Kimberlin & Winterstein, 2008; Mokkink *et al*., 2010).

(b) Test retest reliability, also named stability, is determined by the administration of the measurement at two different points in time among the same participants, with the aim to determine the strength of the association between the two scores. The level of agreement between the two occasions reflects the reliability of the instrument. Importantly, the timing gap between the two measurements should not be short (subject may recall their earlier response) or too long (alteration of response by a change in the health status) (Kimberlin & Winterstein, 2008).

(c) Inter-rater reliability concerns the equivalence of agreement between two observers or two raters. This is for interviewer-administered measures where reliability is determined by the correlation of the scores by two or more independent raters.

1.3.3.2 External validity

The magnitude to which an instrument measures what it is intended to measure is reflected by external validity. Validity requires the reliability fulfillment; however, no measurement can be reliable without being valid. There are different types of validities, such as *content validity* as "*the degree to which the content of an HR-PRO instrument is an adequate reflection of the construct to be measured*"; *criterion validity,* defined as "*The degree to which the scores of an HR-PRO instrument are an adequate reflection of a gold standard*"; and *construct validity,* described as "*The degree to which the scores of an HR-PRO instrument are consistent with hypotheses (for instance with regard to internal relationships, relationships to scores of other instruments, or differences between relevant groups) based on the assumption that the HR-PRO instrument validly measures the construct to be measured*" (Mokkink *et al.*, 2010)*.

(a) Content validity refers to the extent to which the scale's items provide an adequate and representative sample of all items designed to measure the construct of interest. Content validity includes a critical examination of the instrument's structure and a review of procedures followed during instrument development (Machin & Fayers, 2013).

(b) Criterion validity provides the extent to which scores on the new measurement correlate with other measures of the same construct or of similar constructs that are theoretically related; with the condition that the other measures had been previously valid. Two types of criterion validity are available: *predictive* and *concurrent validity*. *Predictive validity* examines the instrument's ability to predict future health status; the future health status can serve as a criterion against which the measure is compared. Meanwhile, *concurrent validity* measures the agreement against a previously established gold standard (Kimberlin & Winterstein, 2008; Machin & Fayers, 2013).

(c) Construct validity requires examining the relationship of the evaluated measure with other known variables for their relationship within the theoretical framework or the related construct. In other words, construct validity examines items' relationship to each other and to the hypothesized scale. Construct validity embraces a variety of techniques, including

correlations with a designed gold standard instrument, changes over time, and group differences. One of the widely used estimates of construct validity is known groups validity, an approach based on the assumption that some groups are prone to score differently from others and that the instrument has to be sensitive to this anticipated difference. A scale without the ability to successfully differentiate among the groups is not considered to be valid (Campbell & Fiske, 1959; Machin & Fayers, 2013).

1.4 Important descriptors and covariates of SUD

Regarding interpersonal risk and protective factors, longitudinal studies have found that substance use has a close association to gender, race (especially among white young adults), ethnicity (for Caucasian), low socioeconomically status during childhood, divorced marital status, mental health problems, and poor interpersonal communication problems, among other variables that represent main risk factors of substance use (Brook *et al.,* 1999; Casswell *et al.,* 2003; Flory *et al.,* 2004; Andres G. Gil *et al.,* 2004; Hawkins *et al.,* 1992; Sher & Gotham, 1999).

1.4.1 Gender

Several previous studies have supported the association between male gender and increased risk for substance use (Brook *et al.,* 1999; Flory *et al.,* 2004; Hicks *et al.,* 2008). It has been previously stated that men have significantly higher prevalence of externalizing disorders (For example alcohol and drug dependence) compared to women, and to have increased changes in symptoms of SUD across time (Hicks *et al*., 2008). Moreover, it is reported that men in young adulthood are more likely to initiate substance use (Brook *et al.,* 1999).

1.4.2 Race/ethnicity

The association between race/ethnicity has been previously supported among young adults; epidemiological studies support the racial/ethnic variations in substance use patterns also among adolescents (Johnston *et al.,* 2011; Stone *et al.,* 2012; Turner & Gil, 2002; Vega *et al.,* 1993). Use frequency and age onset vary considerably among sub-groups such as African Americans and foreign-born Hispanics, with the latter group showing the higher rate of substance-related morbidity and mortality (Andres G. Gil *et al*., 2004).

Race/ethnicity groups experience SUD, especially in the condition when they exhibit a transition from abstaining in adolescence and start a regular use during young adulthood. For example, Andrés G. Gil *et al*. (2004) stated that during this transition phase non-Hispanic whites had a 4.3 times, African Americans a 6.6 times, and Hispanics a 2.8 times increased risk to develop SUD, compared to regular users of the same race. The association is not straightforward, and could be modulated by other factors such as religious commitment, family factors, and socio-economic factors. Yet, few studies have addressed the issue of such (racial) association in determining the rate or degree to which it affects substance use among subgroups (Amey & Albrecht, 1998; Jr. & Bachman, 1991; Turner & Gil, 2002).

1.4.3 Socio-economical status

Association between low income and externalized behavior has been previously established; however, evidence of substance use is less clear in adulthood (Hawkins *et al.,* 1992). Low socio-economical status in childhood was linked to probable nicotine and marijuana use in young adulthood (Buu *et al*., 2009), while some longitudinal studies have suggested that high income is related to higher drinking patterns among young adults (Casswell *et al.,* 2003). The explanation of such contrast could be due to a curved relationship of substance use with higher income and poverty, with the middle-income status being associated with a comparatively low pattern of use (Stone *et al*., 2012).

1.4.4 Marital status

Sher & Gotham (1999) showed that having a partner is a protective factor, while divorce was suggested to be a risk factor for the development for SUD. The relationship is not unequivocal and hard to disentangle, as marriage can be moderating and moderated by various other variables (such as age, cohabitation, etc.) in relation to substance use (Duncan *et al.,* 2006; Sher & Gotham, 1999; Stone *et al.,* 2012).

1.4.5 Education & employment

With regard to education, previous studies have indicated that a high level of education is a protective factor from substance use, while various factors can modify this relationship, such as liking school, educational achievement, and the urge perform well in high school (Fothergill & Ensminger, 2006; Oesterle *et al.,* 2008; Stone *et al*., 2012). Likewise, employment being linked to substance use was controversial; working status was found to be

protective against alcohol use disorder, while unemployed young adults may be found to be at risk of increased substance use. However, this association is not forthright and is linked to other factors, such as marital status, number of work hours per week, and being a college attending peers (Casswell *et al.,* 2003; McMorris & Uggen, 2000; Oesterle *et al.,* 2008).

1.4.6 Mental disorders

A considerable amount of research has affirmed that many psychiatric disorders (such as anxiety, depression, psychosis, and schizophrenia) are related to SUD (Bovasso, 2001; Fazel *et al.,* 2009; Roberts *et al.,* 2007; Ross, 1988); for example, schizophrenic patients showed six times the odds of having SUD compared to the general population (Davis *et al.,* 2008; Regier *et al.*, 1990; Welsh *et al.*, 2017). The association between SUD and psychiatric disorders was previously explained in the literature as a self-medication process, where people used drugs to alleviate distress and vulnerability (Khantzian, 1985; Sinha, 2008). On the other hand, associations between the use of various substance (for example, cocaine, opioids, cannabis) and co-occurring psychiatric disorders were asserted; for instance, opioid use and anxiety disorder (Arunogiri & Lubman, 2015; McHugh, 2015), and marijuana dependence and attention deficit hyperactivity disorder (ADHD) (Wilens *et al.*, 2011).

1.5 Aggressive Antisocial Behavior

Abundant links between externalized problems and substance use have been suggested. The evidence has encompassed measures of unconventionality (Brook *et al.,* 1999), deviant and delinquency behavior (Ferdinand *et al.,* 2001), aggressive antisocial behavior (AAB) (Bor *et al.,* 2010), and offending behavior (Wiesner *et al.,* 2005) either during childhood or adolescence and adulthood.

AAB is regarded as all interpersonal behaviors that meets criteria's of being aggressive and antisocial (Wallinius, 2012). This meaningful distinction with the dual criteria has indicated the presence of two genetically supported distinguished patterns (Burt, 2009): AAB and non-aggressive (rule-breaking) antisocial behavior. In this thesis, the definition will extend to include adolescents (from the age of 15) who fulfill these criteria.

Considerable evidence suggests an unequal distribution of AAB in society. Worldwide, the male gender accounts for almost 80 percent of homicides, while male gender and young age are well known risk factors of AAB (Krug *et al.,* 2002), the majority of crimes are perpetrated

by small number (about 1% of the general population) of violent male offenders characterized by early violent criminality onset, substance abuse, and high level of concomitant non-violent criminality (Falk *et al*., 2014). Age onset was set to be a strong predictor of antisocial behavior, with a peak of onset between ages 18 and 22 (Moffitt & Caspi, 2001). AAB rates vary and differ according to cultures, ethnicity, rural versus urban, and socio-economical status (Krug *et al*., 2002; Moffitt *et al.,* 2002; Reza *et al.,* 2001; Stattin & Magnusson, 1989).

From a developmental perspective, Moffitt (1993) suggested one of the popular contemporary theories of delinquency. Prototypes descriptions included two types of aggressive people: *Life course persistence antisocial behavior* and the *Adolescent limited antisocial behavior*. The former refers to an aggressive or antisocial behavior that is stable and persistent across time, while the latter is more common and refers to a limited temporal aspect.

Life course persistence antisocial behavior is suggested to originate early in life, and is a result of high biological risk in combination with norm breaking behavior in a high-risk social environment (Moffitt, 1993; Moffitt & Caspi, 2001). The child's disruptive and challenging behaviors rise from inherited or learned neuropsychological variations (such as hyperactivity, extreme temperament), while the environment poses risk factors such as inadequate parenting, disrupted family bonds, poverty, and even poor relationships with peers and teachers (Farrington *et al.,* 2009; Moffitt, 2007). Consequently, severe pathology can result in negative outcomes on a person's daily life.

In contrast, the *Adolescent limited antisocial behavior* pathway is more common and refers to a limited continuity during puberty and noticeable decline in adulthood. Normative, non-aggressive antisocial behavior beginning in adolescence and declining in young adulthood are special characteristics of this pathway (Moffitt, 1993; Moffitt & Caspi, 2001). The labeled individuals had had previously a favorable pre-adolescence and normal background, and usually engage in AAB with peers. This pathway is thought to originate from the fact that healthy youngsters are prone to mimic and imitate the antisocial behavior lifestyle as a way to find autonomy from their parents; this has been called a 'maturity gap'. While most of those youngsters had normal and healthy pre-delinquent development, they can easily switch from crime to a more mature and conventional life once they enter adulthood. Nevertheless, previous delinquency can progress through adulthood by the creation of what is called "snares" (such as dropping out of school, financial problems, and substance use onset), which

weaken and compromise young adults' chances of having a prosocial life (Moffitt & Caspi, 2001, 2016).

Aggressive behavior can be assessed at emotive, cognitive, and behavioral levels. During assessment, information can be collected about the frequency, intensity, and types of the behavior. The method used to measure such concept varies in way of administration (for example, self-report, semi-structured interview, observations) and in the psychological process involved (for example, perception, remembering, interpreting).

Self-report instruments, in the one hand, rely on participants' ability to acknowledge and recall aggressive behavior. Thus, answers could be affected and misshaped by social desirability and recall bias (Gothelf *et al.,* 1997; Nijman *et al.,* 2006; Rush *et al.,* 2008). In addition, self-reports are criticized for their dependency on the reader's ability (Edens *et al.,* 2000). Accordingly, some populations with antisocial personality disorders may fail to recognize their role in conflicts and in acting aggressively, and as a consequence might underestimate their own aggression (Coccaro *et al.,* 1997; Nijman *et al*., 2006). According to Coccaro *et al*. (1997), the risk of underestimating one's own aggression is particularly high when aggression is measured solely by a self-rated questionnaire.

Contrary to self-report measures, semi-structured interviews allow investigating subjects and including information from different sources. Semi-structured interviews have more advantages over self-report measures (Coccaro *et al.,* 1997), but they depend on the interviewer's skills, and require training and dynamics from the interviewer in order to obtain the desired quantity and quality of information from the interviewee with no bias or social desirability (Coccaro *et al.,* 1997; Rush *et al*., 2008).

Rating aggression concerns measuring aggressive behavior during a specific timeframe, with the intention to reflect a state or a trait aggression. Trait aggression covers stances that are regular across a long span of time (lifetime) and is correlated with psychological and biological factors. On the other hand, state aggression is qualified as less enduring, transient, and exhibited in a short span of time (days, weeks), and is correlated with environment and contextual factors (Suris *et al*., 2004).

1.6 Living with an adult with alcohol /drug problems

The use of substances by family members is related to several negative outcomes on their children. In particular, the behavior and lifestyle of parents is reflected on the well-being and normal development of their children (Leonard *et al*., 2000; Sivolap, 2015). Studies prove that the presence of an alcoholic parent is related to symptoms of developmental disorders in children (Anda *et al*., 2002; Barnow *et al.,* 2002; Harter & Taylor, 2000). When compared to children without this family burden, children of alcoholic parents show poorer school performance (Park & Schepp, 2014), hyperactivity-expansiveness and poor control of emotions (Sivolap, 2015; Workman & Beer, 1992), greater risk for delinquency and school truancy (Schuckit M Chiles J, 1978), elevated rates of emotional problems, such as anxiety and depression (Anda *et al.,* 2002; Callan & Jackson, 1986), and behavioral problems, such as aggression, oppositional defiant and conduct disorder (Giancola *et al.,* 1996; Reich *et al.,* 1993). Moreover, abundant evidence suggest that growing up in a family where one or both parents use substances raises concern about the increased frequency of somatic health problems affecting children, such as gastrointestinal problems, migraines, headaches (Felitti *et al.,* 1998), chronic lung, liver, and ischemic- diseases, and even cancer (Felitti *et al.,* 1998). Importantly, aggressive behavior in the form of anger, fights, and violent outbursts is often exhibited by children whose parents suffer from alcoholism (Keller *et al.,* 2008).

2 .AIM

The overall aim of the present thesis was to study different aspects of drug use and drug dependence in the general population and high-risk samples of Morocco.

Specific aims:

1. To translate to Arabic the English version of DUDIT and to investigate the psychometric properties of the Arabic version. (Paper I)

2. To investigate potential protective and risk factors of drug dependence in high-risk male samples. (Paper II)

3. To describe the level of aggressive behavior and the prevalence of somatic complaints in the general population of Moroccan adolescents and in those who report parental alcohol use problems. (Papers III & IV)

3 .Subjects and Methods

3.1 Project design and measures

The "Mental and Somatic Health without borders" (MeSHe) project (http://meshe.se) is an international epidemiological study assessing information by a standardized self-reported anonymous survey (the MeSHe survey), focusing on physical and mental health problems coupled with substance use and aggression. The MeSHe survey includes: a background questionnaire about somatic and mental health problems, existing diagnoses and psychosocial factors, and seven previously validated instruments, which are relevant for the scope of the project's aims. These validated instruments are:

1. *Life history of aggression* (LHA). The LHA (Coccaro, 2003) scale is a validated measure of aggressive trait and antisocial behavior. It consists of 11 items, distributed over three subscales: Aggression scale, Antisocial Behavior scale, and Self-directed Aggression scale.

2. *Brief Symptom Inventory* (BSI). BSI (Derogatis & Melisaratos, 1983; Derogatis & Unger, 2010) is a self-report inventory used to measure psychological distress and psychiatric symptoms within nine constructs (for example, depression, anxiety, hostility, psychoticism, paranoia, etc.).

3. *Alcohol Use Disorder Identification Test* (AUDIT). The AUDIT was developed by the collaborative World Health Organization project (Babor *et al.,* 2001; Bohn *et al.,* 1995) and asks participants to self-report alcohol-related behavior during the last 12 months.

4. *Drug Use Disorder Identification Test* (DUDIT). The DUDIT (Berman *et al*., 2004) is a screening instrument composed of 11 items identifying consumption patterns such as risk consumption, abuse, and addiction to drugs.

5. *Positive Affect and Negative Affect Schedule Expanded Form 30 items* (PANAS-X30). PANAS (Watson *et al.,* 1988) is an instrument used to measure two general affective state dimensions: positive (activated and deactivated) and negative (activated and deactivated) affect. (Not included for the prison inmate populations.)

6. *Godin Leisure-Time Exercise Questionnaire* (LTEQ) (Godin & Shephard, 1985; Gaston Godin, 2011). A 3+1-item scale for assessing the intensity and frequency of physical exercise during a typical seven-day period. (Not included for the prison inmate populations.)

7. *Temperament and Character Inventory* (TCI) (Cloninger, Svrakic, & Przybeck, 1993). A well-known instrument that was developed based on the bio-psychosocial model of personality. It has a seven-factor structure with four temperament dimensions (Novelty Seeking, Harm Avoidance, Reward Dependence, and Persistence) and three character dimensions (Self-Directedness, Cooperativeness, and Self-Transcendence). Prof. Robert Cloninger owns the rights to this inventory and has agreed to its use in the MeSHe study in the following languages: English, Arabic, Swedish, Persian, French, Hungarian, and Portuguese.

In the following section, the measures used in the present thesis are described in detail. The background questionnaire assessed retrospective information including sociodemographic, medical, and criminal history, adapted to the relevant study populations.

3.1.1 Sociodemographic data

Sociodemographic variables comprised age, gender, marital status (single, separated, partner, married, remarried, divorced), children (yes/no), education (no qualifications, elementary school, secondary school, high school, higher education (university, college)), and existence of profession or employment (for prison inmate and clinical populations). Medical history (in all three study populations) assessed the presence of previously clinically diagnosed somatic (such as cancer, epilepsy, autoimmune disease, diabetes mellitus, asthma, allergies, skin disease, celiac, chronic obstructive pulmonary disease, tuberculosis, migraine, thyroid disease, hypertension) and psychiatric disorders (such as depression, anxiety disorders, obsessive-compulsive disorder, post-traumatic stress disorder, bipolar disorder, eating disorder, schizophrenia, personality disorder, SUD), as well as information about the type of diagnosis and the age when the diagnosis was received.

3.1.2 Criminal history (only in prison inmate population)

Previous and current criminal sentences and age of the first sentence were assessed in the criminal history section. Criminal behavior categories were displayed in three separate groups: (1) violent crimes, (2) non-violent crimes, and (3) sexual-related crimes.

Violent crimes were defined as any conviction from the following: murder, assault, arson, inmate partner violence, armed robbery, exposing someone to danger, and violations of the legislation against carrying arms/knives in public places. Sexual crimes were assessed

separately from violent crimes. Non-violent crimes included a specific set of crime convictions, such as theft of all kinds, fraudulent practices, and drug-related crimes.

3.1.3 Clinical measures (all three study populations)

3.1.3.1 Drug Use Disorder Identification Test – DUDIT (Papers I and II)

The Drug Use Identification Test (DUDIT) (Berman *et al.,* 2005) is a simple self-report screening instrument detecting problematic drug use in the previous year. It helps to identify use patterns and different drug-related problems in general or clinical populations. Items 1 to 9 are scored on a five-point Likert scale (0, 1, 2, 3, 4) while items 10 and 11 are scored on a three-point Likert scale (0, 2, 4). The total DUDIT score is calculated by the sum of all items' score, generating a maximum score of 44 points.

The 11-item DUDIT has been widely used, thanks to its several advantages, which include the possibility of identifying not only drug dependence, but also at-risk drug use pattern; the brevity of the instrument; its continuous interval scaling rather than dichotomous (yes/no); the suitability of the survey to various sittings and populations; its focus on current drug use problems and consequences (past year); and its shortness and simplicity. In addition, for easy reference DUDIT includes a list of major drugs with illegal substances or abused prescribed medications that are most commonly used.

3.1.3.2 Life History of Aggression – LHA (Paper III)

In the MeSHe project, the different aspects of aggression and its occurrence are measured using the Life History of Aggression (LHA) questionnaire. Originally, LHA was introduced as a semi-structured assessment interview (Coccaro *et al.,* 1997); later, the self-rated version was also widely used to measure aggression over lifetime span (Hofvander *et al.*, 2011). It is an 11-item scale instrument comprising three subscales. The LHA Aggression subscale contains five items (items 1–5), which assess verbal aggression, property destruction (indirect aggression), non-specific fighting (influenced or not by the subject), physical assault (with evidence of intent to harm), and temper tantrums. It has been shown that LHA Aggression subscale scores are strongly correlated with aggressive behavior (Lion, 2005). The LHA Self-directed Aggression subscale includes two items (items 6a–6b) quantifying self-injury behavior and suicide attempts. Finally, the third subscale of LHA, the LHA Antisocial subscale has four items (items 7–10) measuring school problems, such as suspension or

reproof, problems with supervisors like demotion and warnings, antisocial behavior involving the police (for example, arrest and convictions) and events not involving the police. LHA subscales are rated on a six-point Likert-scale (0= no occurrence, 1= one event, 2= two or three events, 3= four to nine events, 4= 10 or more events, and 5= more events than can be counted). The LHA total score is derived from the sum of all items' score, and can range from 0 to 55. LHA psychometric properties showed good internal consistency regarding the total score and for the LHA Aggression and Antisocial subscales; however, lower alpha for LHA Self-directed Aggression was found, admittedly due to the limited number of items (two items) composing this scale. The Cronbach's alpha in the present thesis (Paper III) was 0.68 for the LHA Aggression subscale, 0.38 for the LHA self-directed Aggression subscale, 0.66 for the LHA Antisocial subscale, and 0.75 for the LHA Total scale.

3.2 Subjects

The MeSHe project assesses data from three different study populations: high school students, addicts attending outpatient care facilities, and prison inmates. The present thesis includes studies based on each of these subpopulations. Data from the Moroccan student population is utilized in Papers I, III, and IV, while information from a Moroccan prison inmate sample and from the outpatient clinical sample is used in Papers I and II. Table 1 displays basic characteristics (gender and age distribution) of the study groups.

Table 1. Basic characteristics of study groups used in the present thesis

		Moroccan student sample (*n*=280)	Moroccan prison inmate sample (*n*=177)	Moroccan clinical sample (*n*=72)	Total sample (*N*=529)
Number	Male (%)	145 (51.8%)	177 (100%)	54 (75%)	376 (71.1%)
	Female (%)	135 (48.2%)	-	18 (25%)	153 (28.9%)
Age	Mean (*sd*)	16.75 (.*92*)	30.88 (*10.65*)	38.7 (*8.78*)	24.36 (*11*)
	Median	17	28	39	18
	Range	15-18	15-92	19-56	15-92

3.2.1 High school student population (Papers I, III, & IV)

A cohort of high school students (*n*=280) was recruited from September 2014 to June 2015, from "Sharif IDRISSI" high school in Tetouan, Morocco (for gender and age distribution, refer to Table 1). Data collection was performed in randomly selected classes of 10th, 11th, and 12th grades, and led to the assessment of about 15 percent of the entire student population in

this high school. In each selected classes students received oral and written information about the study, during which the voluntary and anonymous nature of participation was emphasized. A member from the researcher team was present in the classes while students completed the survey. If students required any clarification, assistance was provided by the researcher in charge. In Paper I, a randomly selected sample of 53 male students was included with possible no drug use problem. This sample was used as a true negative sample in the assessment of the discriminative validity of the DUDIT. In Papers III and IV, the entire student population data was analyzed. In these papers students were divided into one of four groups with the probability that one individual can be included in 2 groups at one time: (a) adolescents with no problems: Comparison Group (CG; n=157); (b) adolescent reporting the experience of physical or psychological abuse (PPA; n=71); (c) adolescents reporting Parental Alcohol use Problems (PAP; n=53); (d) Adolescents reporting Parental Alcohol use Problems & Physical or Psychological Abuse (PAP+PPA; n= 25). In the present thesis, results focused on the comparison of CG and PAP groups.

3.2.2 Moroccan prison inmate sample (Papers I & II)

Inmates were recruited from the local "Toulal 2" prison in Meknes, Morocco, during the period from June 2014 to December 2014. The prison inmates (*n*=177) sample represents 7.2 percent of those incarcerated during assessment (for gender and age distribution, refer to Table 1). Prison administrative personnel assisted in the inclusion of the participants. All willing inmates were included in the study, excluding only those who were not able to read and answer the MeSHe survey in the Arabic language. In Paper I, data was analyzed from 169 inmates (out of 177 respondents, eight (4.5 percent) were excluded due to missing information about their age), while Paper II included 137 inmates. For inmates, the answer should have reflected the state prior to incarceration. Table 2 summarizes the criminological characteristics of the inmate sample.

Table 2. Criminological characteristics of the inmate sample (Papers I & II)

	n*	age of first conviction Mean (Range)	number of convictions Mean (*sd*)	number of violent crime convictions Mean (*sd*)	number of non-violent convictions Mean (*sd*)
Total	119 (67.2%)	27.31 (15-62)	1.24 (*2.34*)	.58 (*1.52*)	.67 (*1.25*)

*Listwise deletion (complete-case analysis) removes all data for a case that has one or more missing values.

3.2.3   Moroccan clinical sample (Papers I & II)

Male and female substance-dependent patients seeking treatment in a public outpatient addiction facility managed by the "Association Hasnouna for Drug Users Support" (AHSUD) in Tangier, Morocco, participated voluntarily and anonymously in the MeSHe. The AHSUD organization aims to make treatment seekers more autonomous in society, and its mission is to protect their rights by relying on the values of freedom, acceptance of the other, commitment, empowerment, and progressivism (AHSUD, 2006). Based on previous clinical assessments, all participants met the DSM-IV criteria for SUD, but no differential diagnoses were provided for research due to patient–doctor confidentiality. From February 2015 to April 2015, 72 substance-dependent patients completed the MeSHe survey. Both in Paper I and Paper II, only data from male subjects ($n = 54$) was utilized.

In Paper II both clinical and prison inmate samples were used to constitute high-risk population. For the identification of those with drug dependence (the 'Dependent group') in these high-risk samples, the previously validated cutoff score of the Arabic DUDIT (3.0) was used; there by, those scoring in the DUDIT less than three points formed the group named as the 'Non-Dependent group'. Subjects' education level was categorized into "high education" (that is, those who achieved high school and/or college/university education) and "low education" (subjects reporting secondary school level or less). Their employment was recorded based on a binary reply where current job was indicated (Yes/No). Partnership status was categorized into "living in a partnership" if the subject indicated that he was married or living with a partner; and "single" when the subject indicated that he was divorced, separated, or living alone. Finally, parenthood was also recorded into a binary variable based on having or not having a child.

3.3 Statistical methods

Data was coded in SPSS version 21.0 (IBM) (SPSS Inc, Chicago). The research team performed data entry, coding, and processing. Descriptive statistics such as mean (M), standard deviation (*sd*), median (*Md*), and range (min-max) were calculated for continuous variables, while sample size and percentage were calculated for categorical variables. Categorical variables proportion differences were included in cross-tabulation pattern, and significant differences were assured by chi-square tests. When chi-square assumption was violated, likelihood ratios were used and the degree of association was assessed by phi

coefficient (φ). Risk Ratios (RR) reflecting the probability of different psychiatric disorders in the Dependent group divided by the probability of psychiatric disorders in the Non-dependent group. For all analyses, significance level was set at $p<0.05$.

In order to investigate the psychometric properties of DUDIT (Paper I), several procedures were followed: (a) factor structure analyses using principal axis factoring (PAF) with oblique rotation was used as a rotation method; (b) internal consistency reliability was assessed through the use of Cronbach's alpha coefficient, inter-item, total-item, and item-rest correlations; (c) predictive validity, specificity, sensitivity, and cutoff scores were estimated by Receiver Operation Characteristics (ROC) curve and Area Under the Curve (AUC). With regard to factor structure, suitability of data factorability was carried out simultaneously by Bartlett's test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy. When performing item correlations analyses, Person product-moment (r) correlation was used.

Moreover, regression analyses were performed in order to identify interpersonal factors associated with substance use (Paper II). The multivariable prediction model included the following as independent variables: education level, parenthood, employment, partnership, and depression diagnosis. Beta coefficient (β), adjusted odds ratio (ORs), and 95 percent confidence intervals were reported.

The means of two independent samples were compared by Mann-Whitney U test (Papers I–IV) while three groups comparison were conducted via use of Kruskal-Wallis H; effect sizes were calculated when analyzing gender differences on DUDIT scores within defined groups. Cohen's effect sizes were calculated by dividing the z value by the square root of n, where n reflects the total number of cases. Cohen's r criteria for effect sizes were applied where .1 equals a small effect, .3 a medium effect, and .5 a large effect (Cohen, 1977).

4 .Ethical consideration

All data collection in the MeSHe project is based on voluntary and anonymous participation; therefore, no tracking or following up with individuals is possible. The project is conducted in agreement with the Helsinki declaration. All potential participants received a written and oral presentation of the study and its aims. They were assured that their answers will not have any effect on their present sentence (inmates), treatment plan (clinical population) or academic performance (students), and that no responses could be traced back to the individual level. Before data collection, the study was approved by the "Sharif IDRISSI" high school parents' association (for the student sample), by AHSUD in Tangier (for the clinical sample), and by the Directorate-General of Prison Administration and Rehabilitation (for assessing the prison inmate sample). All answers were recorded on an anonymous response sheet. Those who were not willing to participate could simply leave or not enter the questionnaire room, which provided a private, peaceful environment for answering the MeSHe survey. Participants did not receive any kind of compensation for their participation.

5 .Results

5.1 Psychometric properties of the Arabic Drug Use Disorders Identification Test (DUDIT)

5.1.1 Factorial validity

The 11 DUDIT items were subject to principal factor analysis, and an assessment for suitability of data was performed. The resulting Kaiser-Meyer-Olkin value was .93, while Bartlett's test of sphericity reached statistical significance, supporting the factorability of data. Further, the scree plot (Figure 1) revealed a break just after the first factor, with an eigenvalue > 1 (7.36), explaining 66.9 percent of the variance. The following eigenvalue was .75 and accounted for just 6.81 percent of the total variance. Factor loadings for all items ranged from .66 (item 10) to .86 (item 1) (Table 3).
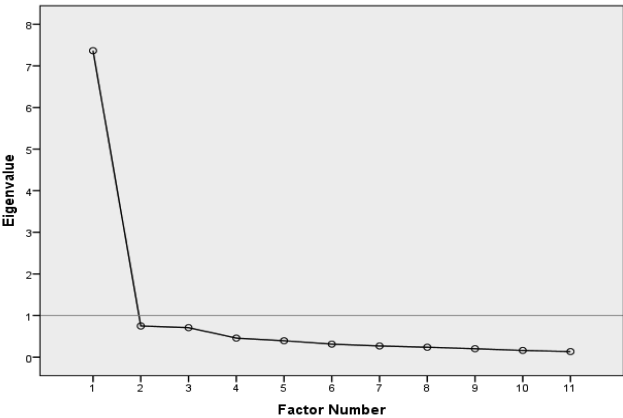

Figure 1. Scree Plot for the Principal Axis Factoring (PAF) for DUDIT administered in a Moroccan mixed sample

Table 3. Factor loadings for DUDIT items (n= 240)

	DUDIT items	Factor 1
1	How often do you use drugs other than alcohol?	.86
2	Do you use more than one type of drug on the same occasion?	.68
3	How many times do you take drugs on a typical day when you use drugs?	.82
4	How often are you influenced heavily by drugs?	.79
5	Over the past year, have you felt that your longing for drugs was so strong that you could not resist it?	.83
6	Has it happened, over the past year, that you have not been able to stop taking drugs once you started?	.82
7	How often over the past year have you taken drugs and then neglected to do something you should have done?	.78
8	How often over the past year have you needed to take a drug the morning after heavy drug use the day before?	.85
9	How often over the past year have you had guilt feelings or a bad conscience because you used drugs?	.86
10	Have you or anyone else been hurt (mentally or physically) because you used drugs?	.66
11	Has a relative or a friend, a doctor or a nurse, or anyone else, been worried about your drug use or said to you that you should stop using drugs?	.79

DUDIT = Drug Use Disorders Identification Test

5.1.2 Internal consistency

Cronbach's alpha was calculated for DUDIT in the total study population, showing excellent internal consistency (.95). The Cronbach's alpha coefficient was also calculated within each group, proving a stable and strong correlation between the items in each sample (.94 in the inmate's sample, .89 in the clinical sample, and .94 in the young adult's sample). The range of item-total correlations was between .70 and .88. Additionally, item-rest correlations (IRC) were all above .65, which shows that items highly correlate with the scale. Table 4 displays the inter-item, total item, and item-rest correlations.

Table 4. *Inter-item, total-item and item-rest correlations (IRC) for DUDIT (n = 240)*

	DUDIT Items	1	2	3	4	5	6	7	8	9	10	11	**IRC**
1	How often do you use drugs other than alcohol?	1											.84
2	Do you use more than one type of drug on the same occasion?	.65	1										.66
3	How many times do you take drugs on a typical day when you use drugs?	.80	.69	1									.80
4	How often are you influenced heavily by drugs?	.74	.57	.66	1								.77
5	Over the past year, have you felt that your longing for drugs was so strong that you could not resist it?	.68	.47	.63	.64	1							.81
6	Has it happened, over the past year, that you have not been able to stop taking drugs once you started?	.62	.52	.65	.66	.75	1						.79
7	How often over the past year have you taken drugs and then neglected to do something you should have done?	.61	.54	.63	.56	.72	.72	1					.75
8	How often over the past year have you needed to take a drug the morning after heavy drug use the day before?	.68	.58	.71	.63	.73	.81	.71	1				.83
9	How often over the past year have you had guilt feelings or a bad conscience because you used drugs?	.78	.54	.66	.69	.69	.67	.65	.70	1			.84
10	Have you or anyone else been hurt (mentally or physically) because you used drugs?	.59	.43	.44	.58	.57	.50	.44	.53	.64	1		.65
11	Has a relative or a friend, a doctor or a nurse, or anyone else, been worried about your drug use or said to you that you should stop using drugs?	.69	.46	.63	.58	.70	.60	.60	.67	.77	.59	1	.77
	DUDIT score	.88	.72	.84	.82	.84	.83	.79	.86	.88	.70	.82	

DUDIT= Drug Use Disorders Identification Test. All correlations are significant at $p < 0.001$

5.1.3 Predictive validity

The mean DUDIT score for the clinical sample diagnosed with SUD ($n = 54$) was 24.54 ($sd = 12.05$); this was significantly ($p<0.001$) higher than in the young adult sample with no clinical SUD diagnosis ($n = 53$) (M = 1.34; $sd = 4.43$, $U = 64.000$). The difference had a large effect

size (Cohen's r =.85). A logistic regression model predicting group membership (SUD or no SUD) was statistically significant ($\chi 2$ (1, n = 107) = 93.52), indicating that the reported DUDIT score correlated highly with the existence of a SUD diagnosis. The overall model explained between 58.3 percent (Cox and Snell R-square) and 77.7 percent (Nagelkerke R-squared) of the variance of group membership, and showed that the DUDIT score was effective in terms of correctly classifying the clinical sample with SUD and individuals without existing SUD in 88.8 percent of cases. Predictive validity was examined using ROC analysis, where AUC reached .98 ($p<0.001$, CI = .95 - 1.00) (Figure 2). Optimal sensitivity and specificity (.98 and .90, respectively) matched a cut-off score of 3 (Table 5).
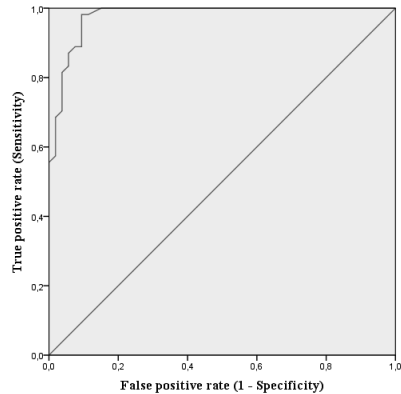
Figure 2. Receiver Operating Characteristic (ROC) curve for DUDIT score (independent variable) and group membership (dependent variable). Area under the curve (AUC) was .98 (p<0.001, CI = .95-1).

Table 5. Specificity, sensitivity, and cut-off scores for the DUDIT (n = 107)

Cutoff scores	Sensitivity	Specificity
1	1	.42
2	.99	.87
3[a]	**.98**	**.90**
4	.94	.91
5	.89	.92
6[b]	.88	.93
7	.86	.94
8	.84	.94
9	.82	.95
25[c]	.28	1

[a] Optimal sensitivity and specificity in the Arabic DUDIT for identification of drug dependence
[b] Suggested cut-off for drug-related problems
[c] Suggested cut-off for drug dependence

5.2 Drug use profiles of clinical and inmate population compared to general population (student population)

The Kruskal-Wallis H Test revealed a statistically significant difference in DUDIT total score across three different membership groups (Gp1, n=137: inmates; Gp2, n=72: clinical population; n=226: student control group), χ2 (2, n=435) = 213.79, p<0.0001. Clinical participants recorded a higher median score (Md= 28.5) compared to the other two groups, revealing a median value of (Md= 2) for inmates and (Md= 0) for the student control group (Table 6).

Table 6. Group membership comparisons for DUDIT total score.

	Inmate participants (n=137)	Clinical population (n=72)	Student control group (n=226)	Difference between groups	
	Md (Range) M (*sd*)	*Md* (Range) M (*sd*)	*Md* (Range) M (*sd*)	Test-stat (*H*)	*p*- value
DUDIT Total	2 (0-44) 11.04 (*13.83*)	28.5 (2-44) 25.94 (*12.05*)	0 (0-29) 1.02 (*3.64*)	213.79	<0.0001

When male and female participants' DUDIT total scores were compared for group membership (Gp2, n=72: clinical population; n=226: student control group), one significant difference at p <0.05 was revealed for the clinical population, while no difference regarding gender was reported for the student control group p > 0.05. Table 7 shows results from Mann-Whitney U test, *p, and r values*. Means, standard deviations, medians, minimum, and maximum scores are included in the table for descriptive purposes.

Table 7. Mann-Whitney U test comparisons by gender for clinical and student populations.

	Clinical population (n=72)		Difference between groups		
	Male (n=45) *Md* (Min-Max) M (*sd*)	Female (n=18) *Md* (Min-Max) M (*sd*)	Test-stat (*U*)	*p*- value	*r*
DUDIT Total	27 (2-44) 24.54 (*12.05*)	34.5 (4-40) 30.17 (*11.33*)	338.000	=0.05	.22
	Student control group (n=226)		Difference between groups		
	Male (n=113) *Md* (Min-Max) M (*sd*)	Female (n=113) *Md* (Min-Max) M (*sd*)	Test-stat (*U*)	*p*- value	*r*
DUDIT Total	0 (0-29) 0.97 (*3.48*)	0 (0-28) 1.06 (*3.8*)	6190.000	=0.514	.04

5.3 Protective and risk factors of drug addiction

The mean age of the clinical outpatients sample was 38.3 (*sd*=8.3), and the mean age of the prison inmate sample was 30.8 (*sd* =10.6). However, no significant differences were detected in age, age when they finished education, and prevalence of selected psychiatric problems between these two samples.

5.3.1 Comparison of Dependent and Non-dependent groups

When dividing subjects by the eventual presence of drug dependence during the past 12 months into Dependent and Non-dependent groups, significant differences were found (Table 8). Fewer subjects in the Dependent group lived in a partnership, had a child, had high education, or were employed when compared to the Non-dependent group (*p*< 0.001 in each case). In detail, over two-thirds (67 percent) of those indicating drug dependence during the past 12 months had a low education level, compared to only one-third (32 percent) of those who reported no or minimal (less than 3 points in DUDIT) drug use.

A chi-square test for independence indicated significant difference, with medium effect size between drug dependence and the level of education, (χ^2 (1, n=189) = 21.3, *p* <0.001, *phi*= .34). The majority (82 percent) of the Dependent group and more than half (57 percent) of the Non-dependent group reported being single, and in a similar ratio they reported not having any children (80 percent and 46 percent, respectively). For drug dependence, chi-square tests for independence indicated a weak but significant association with marital status (χ^2 (1, n=190) = 13.2, *p* <0.001, *phi*= .26) and with parenthood status (χ^2 (1, n=184) = 21.4, *p* <0.001, *phi*= .34). In a similar way, the unemployment rate was more than three times higher in the Dependent group (43 percent) than in the Non-dependent group (13 percent). A chi-square test showed a significant and medium strong association between the existence of drug dependence and unemployment (χ^2 (1, n=187) = 17.4, *p* <0.001, *phi*= .30).

While the presence of any psychiatric disorder was not significantly different between the groups (47 percent and 38 percent, respectively), a comparison of the prevalence of defined disorders revealed that depression was a significantly more frequent co-existing problem in Dependent individuals (22 percent) compared to Non-dependent individuals (3 percent) (χ^2 (1, n=167) = 9.96, (*p* <0.001), *phi*= .24).

Risk ratios revealed that the Dependent group had a 6.4 times higher risk of depression compared to the Non-dependent group. Likewise, the risk of obsessive-compulsive disorder

(OCD) was 2.7 times higher, and the risk of schizophrenia and personality disorder doubled, while the risk of a co-existing eating disorder was 25 percent lower in the Dependent group when compared to the Non-dependent group.

Table 8. Socio-demographic and clinical background of participants (n=191)

Background variables	Total sample [h] % (n)	Dependent group [f] (n=119)	Non-dependent group [f] (n=72)	RR[g]	t / χ²	p-value	φ
Age M (sd)	32.7 (10.62)	32.52(10.95)	34.01(10.08)		.935	0.73	
Education dropout Age	16.95 (7.7)	15.93(4.29)	19.45(3.61)		4.21	0.65	
Education [a] % (n)							
High educational level	46% (87)	33.1% (39)	67.6% (48)		21.31	<0.001	.34
Low educational level	54% (102)	66.9% (79)	32.4% (23)				
Marital Status [b]							
In a relationship	27.9% (53)	18.6% (22)	43.1% (41)		13.25	<0.001	.26
Single	72.1% (137)	81.8% (96)	56.9% (31)				
Parenthood							
Yes	32.6% (60)	20.5% (24)	53.7% (36)		21.4	<0.001	.34
No	67.4% (124)	79.5% (93)	46.3% (31)				
Employment							
Yes	67.9% (127)	57.1% (68)	86.8% (59)		17.42	<0.001	.30
No	32.1% (60)	42.9% (51)	13.2% (9)				
Psychiatric disorders [c]							
Yes [c]	44.1% (79)	47.4% (54)	38.5% (25)		1.33	0.25	
No [c]	55.9% (100)	52.6% (60)	61.5% (40)				
Depression	15% (25)	21.5% (23)	3.3% (2)	6.44	9.96	0.002	.24
Anxiety	20.9% (37)	21.2% (24)	20.3% (13)	1.04	.02	0.88	
OCD [d]	10.6% (18)	13.6% (15)	5% (3)	2.72	3.06	0.08	
PTSD [e]	19% (34)	19.1% (21)	18.8% (13)	1.01	.00	0.97	
Bipolar disorder	3.4% (6)	3.8% (4)	3.3% (2)	1.17	.036[Lh]	0.85	
Eating disorder	21.1% (38)	18.8% (21)	25% (17)	0.75	.992	0.32	
Schizophrenia	5.7% (10)	7.3% (8)	3.1% (2)	2.36	1.46[Lh]	0.23	
Personality disorder	9.4% (16)	11.1% (12)	6.3% (4)	1.75	1.06	0.30	

φ: Phi Coefficient (Mean Square Contingency Coefficient)

[a] Education was divided into *high educational level,* which included those with high school and /or university/college education, and *low educational level,* which included those with no education or only elementary/secondary school education.

[b] Living in a relationship includes the situations of being married, remarried, and living with a partner. Not living in a relationship comprises being single, divorced, and separated.

[c] The existence of a SUD diagnosis was excluded from psychiatric diagnoses.

[d] Obsessive-Compulsive Disorder.

5.3.2 Predictors of drug dependence

In the multivariable prediction model, only those variables that significantly differed between the groups were fitted in. The final model included the following factors: education level, having a child, employment, partnership, and existing diagnosis of depression. Table 9 presents the multivariable associations of sociodemographic and clinical correlates with drug dependence.

The model containing all predictors was statistically significant (χ^2 (df = 5, n=156) = 63.90, p<0.001), showing that the model could explain over 60 percent of drug dependence. Four of the predictor variables (education level, existence of employment, having children, and diagnosis of depression) had a highly significant contribution to the model. The strongest predictor of drug dependence in this model was the existence of a diagnosis of depression. Participants who had reported the existence of a diagnosis of depression were 17 times more likely to be screened for drug dependence. Conversely, high education level, having a child and being employed were significant protective factors from drug dependence. Participants with higher education profile were about seven times less likely to be screened for drug dependence. Having children and having an employment also decreased the likelihood (about four times and five-and-a-half times, respectively) of drug dependence (Table 9).

Table 9. Multivariable model for prediction of drug dependence.

Predictors	β	SE 95%	*p*-value	e^B /OR	95% CI
Education	-1.862	.448	< 0.001	.15	.065 - .374
Marital Status	-.531	.643	0.41	.59	.167 – 2.075
Parenthood	-1.295	.628	0.039	.27	.080 - .937
Employment	-1.709	.524	0.001	.18	.065 - .505
Depression	2.821	.879	0.001	16.79	3.001 – 93.968

CI: Confidence interval; OR: Odds Ratio; SE: Standard error.
Model Summary; (χ^2 (5, n=156) = 63.90, p<0.001).

5.4 The level of aggression and prevalence of somatic complaints in adolescents reporting parental alcohol abuse

While most students did not report problems with parental alcohol use (85.6 percent), a considerable number of teenagers reported having at least one parent with problematic use of alcohol (14.4 percent). There were significantly more boys reporting parental alcohol problems than girls (11 percent and 7.3 percent, respectively; p=0.002).

5.4.1 The level of aggression in adolescents reporting parental alcohol problems

The scores of the LHA total scale and LHA Aggression subscale were significantly higher in those who reported a family member with alcohol use problems (PAP group) (p=0.004, p=0.012, respectively) compared to those adolescents reporting no alcohol abuse in their family (CG group). Table 10 displays means and standard deviations of LHA subscales among the two groups (PAP and CG).

Table 10. The level of trait aggression (and its subscales) in teenagers who reported parental alcohol use compared to those who did not reported parental alcohol use problems.

LHA subscales	CG	PAP	U	p-value
Total scale M (*sd*)	8.02 (6.20)	12.27 (7.4)	1214.00	0.004
Aggression M (*sd*)	6.68 (4.59)	9.81 (5.91)	1352.00	0.012
Self-directed Aggression M (*sd*)	0.56 (1.39)	0.62 (0.94)	1713.00	0.243
Antisocial Behavior M (*sd*)	0.74 (1.57)	1.43 (2.67)	1914.00	0.363

CG= Comparison Group
PAP= Adolescents reporting Parental Alcohol use Problems

5.4.2 The prevalence of somatic complaints in adolescents reporting parental alcohol problems

A Mann-Whitney U test revealed no significant difference in the average number of somatic complaints between adolescents who reported family alcohol use problems (M= 1.5, *sd*= 1.17) and those without parental alcohol use problem (M=1.39, *sd*= 1.43; *U*= 1944.5; *z*= -.957, *p*= 0.339). When analyzing the prevalence of specific somatic complaints, adolescents with parental alcohol use problems reported migraines twice as often (p=0.065), headaches one-and-a-half times more often (p=0.038), and six times more-often occurrence of diabetes than their peers who did not report parental alcohol use problems. The prevalence of other

somatic complaints were not higher in adolescents who reported parental alcohol use problems (Table 11).

Table 11. Prevalence of somatic complaints in teenagers who reported parental alcohol use problems compared to those who reported not having these problems.

Somatic complaints	CG (*n*=157)	PAP (*n* =53)	t / χ^2	*p*-value	ϕ
Epilepsy	3.4%	3.6%	0.003	0.954	0.04
Migraine	10.7%	24%	3.409	0.065	0.14
Headaches	52.5%	74.1%	4.287	0.038	0.16
Diarrhea/constipation	21.8%	26.1%	0.214	0.644	0.03
Gluten intolerance	9.6%	0%	2.817	0.093	0.12
Skin disease	14.8%	11.5%	0.188	0.664	0.03
Chronic obstructive pulmonary disease	0.6%	0%	0.175	0.676	0.03
Cancer	1.3%	0%	0.380	0.538	0.04
Autoimmune diseases	3.5%	0%	0.973	0.324	0.07
Diabetes	0.7%	3.8%	1.919	0.166	0.10
Asthma	3.3%	8%	1.235	0.266	0.08
Tuberculosis	1.3%	0%	0.355	0.552	0.04
Other Allergies	25.4%	10.7%	2.830	0.093	0.13
Thyroid disease	2%	0%	0.566	0.452	0.05

CG= Comparison Group
PAP= Adolescents reporting Parental Alcohol use Problems

6 .Discussion

(1) The Arabic translation of DUDIT has high reliability and validity. In the Arabic version, a cutoff ≥ 3 points is determined for identifying individuals with drug dependence.

(2) Within the clinical population, female patients had higher scores on DUDIT compared to male patients.

(3) The diagnosis of depression is the only significant risk factor, while a higher level of education, having a child, and being employed are protective societal factors from drug dependence in Moroccan high-risk populations.

(4) Living with parent(s) who has alcohol-use problem associated with increased level of aggressive behavior and increased prevalence of some defined somatic problems in adolescents.

6.1 Internal and external validity of DUDIT

The Arabic-translated version of DUDIT has exhibited excellent psychometric properties. At first, factorial structure analysis supported the one-dimensional construct of the instrument. Equally important, excellent internal reliability by mean of Cronbach's alpha coefficient (α=.95), inter-item, item-total (range 0.7 -0.88), and item-rest correlations have been displayed. Additionally, predictive validity based on ROC analysis showed an AUC of .98, reflecting high concurrent validity. Maximal sensitivity and specificity values revealed a corresponding cutoff score of 3 (sensitivity .98 and specificity .90). For these reasons, the DUDIT score indicated an ideal fit with DSM-IV diagnosis of SUD, consequently qualifying the instrument as excellent in distinguishing between potential drug-dependent and non-drug-dependent users (Paper I).

In term of factorability, a one-factor construct revealed by principal axis factoring was concluded. Similar result was reported in other versions (Turkish, Dutch, and American versions of DUDIT) producing one-dimensional construct (Evren *et al.,* 2014; Hildebrand & Noteborn, 2015; Voluse *et al.,* 2012). Similarities between these four studies reside in the fact that all four used heterogeneous samples with a relative predominance of male subjects. The original Swedish version of DUDIT, with a sample of drug users, suggested a three-factor solution. These factors were labeled *dependence, drug-related problems,* and *intensity of use.* Even with the Swedish DUDIT, in the general population only two of these three factors

(*dependence and drug-related problems*) were identified (Berman *et al*., 2005). In the same manner, a two-factor solution resolved by Principal Component Analysis (PCA) with varimax rotation was established for the Hungarian version (Matuszka *et al.,* 2014). In this case, it was discussed that the presence of two factors may be due to the different characteristics of the sample set used. However, the Moroccan sample also had a mixed composition, and yet supported the presence of the one-dimensional construct. The unidimensional structure was further supported by the Turkish version of DUDIT among male prisoners (Evren *et al.,* 2014) using confirmatory factor analysis, as well as among adolescent and adult in-patients with drug use disorder (Evren *et al.,* 2014).

The reliability of the Arabic DUDIT was excellent, consistent with all other language versions' reliability tests (Evren *et al.,* 2014; Hillege *et al.,* 2010; Landheim *et al.,* 2006; Matuszka *et al.,* 2014; Voluse *et al.,* 2012).

The ROC curve demonstrated good predictive validity for DUDIT as suggested by sensitivity, specificity, and AUC. The most critical value (where there is maximal sensitivity and maximal specificity) for identifying drug dependence was the score of 3 or above on the Arabic DUDIT. This is notably lower than the value reported by Berman *et al*. (2004) in a Swedish cohort sample (cut-off for defining drug addiction >= 25), but comparable to the value found during the Hungarian validation study (Matuszka *et al.,* 2014) (cut-off for defining drug addiction >= 2.1). It is important to point out that the original article (Berman *et al*., 2004) with the cut-off of 25 or more referred to DSM-IV/ICD-10 diagnoses based on a full diagnostic interview. The original Swedish study was conducted in samples of hospitalized or incarcerated subjects suffering from drug abuse or addiction, while Matuszka *et al*. (2014) and other authors (Voluse *et al*., 2012) worked with a study population that included less severe substance use problems and referred to other diagnostic measures, such as the DAST and ICD-10 substance-dependence diagnoses. Even so, in the present study (Paper I) each of the patients in the clinical sample had a SUD diagnosis based on DSM-IV criteria, though we did not have enough information to be able to differentiate subgroups according to the severity of drug abuse. Henceforth, the cut-off would obviously be much lower for hazardous and harmful use than for dependence or abuse. In order for a screening instrument to be considered clinically useful, sensitivity and specificity values must be above .80 (Tiet *et al.,* 2008). The AUC of .98 of the Arabic DUDIT reflects a high concurrent validity, while the extremely high sensitivity and specificity (.98 and .90, respectively) of the

cutoff point 3 indicates that the Arabic DUDIT can be considered "excellent" at separating drug users from non-drug users in Arab-speaking countries.

6.2 Occurrence of drug dependence by gender

Gender differences in the extent and in the effects of drug consumption are well studied (Ait-Daoud *et al.,* 2017; Stevens *et al.,* 2009; Tuchman, 2010). Previously, it was consistently considered that substance use is a male-predominant problem, but prevalence rates from the past two decades indicate increasing numbers of female drug abusers, consequently referring to substance abuse as a non-gender-specific disorder (Brady & Randall, 1999). However, today it is an accepted knowledge that overall drug abuse remains low among women when compared with drug abuse among men. At the global level, men are three times more likely than women to use cannabis, cocaine, or amphetamine (NIDA, 2015). However, once the abuse begins, women tend to increase their rate of drug consumption more quickly than men (Becker & Hu, 2008) and can develop dependence faster than men (Dwyer & Fraser, 2017; Green, 2006; Grella, 2008). This tendency was also confirmed in the present study as we found that female Moroccan clinical outpatients had a significantly higher score on DUDIT (M=30.17) than male outpatients (M=24.54). To our knowledge, no other study has yet investigated gender differences in substance abuse with the help of DUDIT. Women are more prone to abuse prescription drugs than men, especially opiates and sedatives (Grella, 2008; United Nations Office on Drugs and Crime (UNODC), 2015). This mainly reflects differences in the possibilities of using drugs due to the impact of the social or cultural environment, rather than inherent gender vulnerability (Van Etten & Anthony, 2001). A large amount of evidence has shown that initiation of drug use, as well as biological responses and progression to the development of drug addiction, varies considerably between men and women (Tuchman, 2010). It is important to discuss the fact that problematic substance abuse among women was – and still is – a hidden problem, strongly regulated by cultural dogmas and coupled with extreme stigmatization, including in Western countries, but even more so in developing countries.

6.3 Occurrence of drug dependence in high-risk samples

The mean score of Moroccan outpatients on DUDIT (M=25.94) was similar to that previously found in a US clinical sample (M=26; (Voluse *et al.,* 2012)) and in a Turkish adolescents sample with SUD (M=23.5; (Evren *et al.,* 2013)), however, it was higher than that what was found in a sample of Hungarian outpatients (M=17.8; (Matuszka *et al.,* 2014)). Interestingly,

the original Swedish study reported a significantly higher drug use in Swedish outpatients (M =32.7; Berman *et al*., 2004).

When using DUDIT to assess drug use patterns in other high-risk samples, such as prison inmates, the Moroccan results (M=11.04) were comparable to results from relapsed substance abusers in Norway (M=16.9; (Landheim *et al*., 2006)), while relatively higher than among Dutch probationers (M=7.5; (Hildebrand & Noteborn, 2015)), and notably lower than results reported among Swedish prison inmates and probation clients (M=33.7; (Berman *et al.,* 2004)).

Comparisons of DUDIT scores between different nations' high-risk samples suggest that cultural aspects of drug use should be seriously considered and investigated when discussing prediction and prevention of drug abuse. These comparisons also show the importance of using internationally standardized instruments for measuring the extent of drug use.

6.4 Risk and protective factors of drug dependence

Specific social and clinical characteristics have emerged (Paper II) when comparing Moroccan drug-dependent individuals to non-drug dependent individuals (groups defined based on their scores compared to Arabic DUDIT's cutoff).

Educational factors (for example, school attachment, high expectations for educational achievement, and striving to perform well in school) have been previously associated with decreased substance use involvement (Fitzpatrick *et al.,* 2005; Mirza & Mirza, 2008; Piko & Kovács, 2010), which has also been confirmed in the Moroccan sample, indicating that high level of education is a protective factor from substance dependence. While previous studies assessed protective factors among younger samples, results of our study confirmed the same findings in high-risk Moroccan populations, indicating that education is the strongest and probably persistent protective factor, independent of age and societal factors.

Besides education, another important interpersonal factor of drug dependence was employment. It was three times more common to be unemployed at the time of clinical treatment or before incarceration among the drug-dependent group compared to the non-drug dependent group (Paper II). Previous studies were inconclusive reporting both positive and negative effects of working (having an employment) on substance abuse (Stone *et al*., 2012). Bachman (1999) found that employed men had a lower risk to increase illegal drug use in young adulthood. The association between unemployment and drug use has been suggested to

be mediated by personality traits – such as stress reactivity or impulsivity – that could relate unemployment to substance abuse (Compton *et al.,* 2014). Results confirmed the hypothesis of Faupel (1988) that employment, especially legal employment, can move addicts from drug culture to mainstream culture, possibly because legal employment leaves neither time nor the need to look for illicit income sources.

The third important protective factor that emerged in our study was parenthood. This is in accordance with previous findings showing that parenthood is most often linked to limited or no drug use, and therefore custodial parenthood results in the decline of the risk of drug dependence (Jerald G. Bachman *et al*., 2002; Fergusson *et al.,* 2012). However, it is interesting to note that marijuana use among men was not affected by their partner's pregnancy, as well as by later onset of parenthood (Bailey *et al.,* 2008). Parenthood is capable of mediating other variables in relation to substance use, and may itself be subject to moderation by other variables; for example, it also can be mediated by personality traits. Some studies have suggested that the transition to parenthood triggers positive personality trait changes, such as higher level of agreeableness, openness, and – mainly in females – high conscientiousness (van Scheppingen *et al.,* 2016). It is important to mention that age by itself was not correlated to substance use; therefore, the protective action of parenthood and employment is not mediated by older age.

Our findings suggested that relationship status was not a significantly affecting factor of drug dependence in the male Moroccan high-risk populations. Other interesting evidence, though not fully supported by our results, proposed that living arrangement could be predictive of substance involvement: while marriage was protective, divorce imparted risk of developing a SUD (Sher & Gotham, 1999).

It is increasingly accepted that most people with mental illness (most often internalizing behaviors), especially depression, are at major risk of developing SUD. This was also confirmed in the Moroccan high-risk samples. While the existence of (any) psychiatric problem revealed no association with drug dependence, depression significantly increased the risk of coexisting drug dependence in inmates and outpatient individuals. This result is in accordance with previous findings showing that drug use and depression coexist in clinical and prison inmate samples (Najt *et al.,* 2011; Ross, 1988; Rowe *et al.,* 1995; Vreugdenhil *et al.,* 2003). While many studies have confirmed the association between depression and drug use, the explanation of their link is still not complete. Bovasso (2001) found that adult

participants with an initial diagnosis of cannabis abuse are four times more likely to have depressive symptoms at a follow-up assessment than those with no diagnosis of cannabis abuse. Other longitudinal studies have suggested that substance use precedes depressive symptoms (Angst, 1996; Grant, 1995; Weller & Halikas, 1985).

One of the most important findings of our study was that education should be considered as a protective factor of relapse/development of drug dependence in high risk Moroccan samples. The other is that the presence of depression is a significant risk factor in high-risk patients and should be met with adequate treatment strategies at the same time as the treatment of SUD is taking place. This result emphasizes the importance and need of integrated addiction care, where treatment strategies do not focus sequentially on the different diagnoses in a patient (such as primary and secondary diagnosis), but instead offer a holistic treatment capturing all psychiatric problems at the same time (Mueser, 2003).

6.5 Level of aggression and prevalence of somatic complaints in adolescents reporting parental alcohol use

Growing up in a family where parent(s) abuse alcohol could have serious outcomes for children. Parental alcohol use is associated with negative parenting styles, such as emotional rejection, harsh punishment (Barnow *et al.,* 2002), neglect, dysfunctional family interactions, family separations, and parental violence (Dube *et al.,* 2001), all of which strongly influence the well-being of adolescents (Anda *et al.,* 2002) and may contribute to their stress (Margolin & Vickerman, 2007) and psychiatric problems (Repetti *et al.,* 2002), which consequently can enhance aggressive behavior (Herts *et al.,* 2012).

Our results confirmed an increased level of aggression in adolescents who reported parental alcohol use (Paper III). It has been previously shown that aggressive behavior in children and adolescents is combined with a high level of impulsive and sensation-seeking temperament profile (Kerekes *et al.,* 2017; Schmeck & Poustka, 2001). It has also been shown that children from alcoholic families were more impulsive and sensation seekers (Chassin *et al.,* 2004), showing temperament profiles that are coupled with pathological childhood aggressive behaviors. In a new review about genetic and epigenetic mechanisms behind the development of aggression, Waltes and colleagues (2016) concluded that environmental effects (such as early-life stress or chronic psychosocial risk factors), together with biological (genetic) vulnerability in a child, will increase the risk of developing AAB. According to some current hypotheses, epigenetic changes (mechanisms which will allow reprogramming of the genome

upon environmental inputs at specific time-points during development) will increase children's possibility of survival in threatening environments (Waltes *et al., 2016*).

Our study has shown that adolescents living with at least one parent who has alcohol use problem do not report more somatic complaints than their peers without parental alcohol use problems; however, specific somatic complaints were more frequent – typically migraines and headaches. Migraine headaches are common, affecting approximately 3–10 percent of children and adolescents worldwide (Abu-Arafeh *et al.,* 2010; Pakalnis *et al.,* 2005). While the prevalence of migraine in the comparison group of adolescents was comparable to previously published prevalence, in the groups of adolescents with parental alcohol use problem it was two-and-a-half times higher. One-fourth of this group had migraines, which is a very high prevalence, considering the serious symptomology of migraines (such as throbbing, pulsating pain, light and sound sensitivity, nausea, blurred vision, vomiting) and the fact that these adolescents have to perform in high school every day. Common triggers of migraines and headache are hunger, dehydration, stress, and change in routines. The high prevalence of these neurological complaints in adolescents with parental alcohol problems suggests that these individuals may live with increased stressed in their homes, and have difficulties in keeping their routines.

We have also found that adolescents reporting parental alcohol use problems reported diabetes six times more often than the comparison group. The prevalence of type-1 diabetes is 2–5 percent worldwide (Maahs *et al.,* 2010). In our study population, less than 1 percent of the comparison group reported the existence of diabetes, while almost 4 percent of those who reported parental alcohol use problems also reported diabetes. Previous research has suggested that stressful life events in childhood (where parental alcohol abuse can easily be listed) can triple the risk of developing type-1 diabetes (Nygren *et al.,* 2015).

While it is important to notice the behavioral changes of children who are living in a family with addiction problems, it is also important to see the indirect effects of addiction, and study these children's somatic and mental health. To our knowledge, we are the first group to study Moroccan adolescents' somatic and mental health and to focus on the effects of parental alcohol abuse on these factors.

One of the most important aims of the MeSHe project is to focus on the holistic picture of drug abuse. This means both to capture cultural differences (which are rarely investigated in

studies focusing on prediction and prevention of drug abuse) and to show somatic as well as mental health problems that are coupled with drug use and abuse.

7 .Conclusion

The Arabic version of DUDIT is proven to be a valid and reliable instrument to identify individuals with drug dependence in Arab-speaking countries. It had good or excellent psychometric properties, justifying the use of this instrument for the assessment of drug use and for the evaluation of addiction treatment strategies in different settings. Importantly, as the DUDIT has been translated to many languages and each of those versions were also validated, it represents an excellent instrument for reliable international analyses about drug addiction and associated factors.

With the help of the Arabic translation of DUDIT, previously published associations between drug dependence, defined socio-demographic, and psychiatric factors are now also confirmed in Moroccan study samples. The Arabic DUDIT was one of the first instruments to be used to study gender differences in drug addiction.

The serious but rarely studied indirect effects of parental alcohol abuse on their children's mental (including deviant behaviors) and somatic ill health strengthen the need for further studies about drug addiction and dependence, to be able to implement integrated treatments and focus on holistic social-psychiatric care on both addicts and their family.

8 .Limitations

The present thesis comprises various methodological approaches utilized in all papers, each with specific limitations.

The cross-sectional design of the MeSHe study is conducted at one point in time, and consequently limits the possibility of causality analyses (cause-and-effect relationships). As the collected data is based on self-reports, recall bias and the fact that individuals are more likely to respond when they have a particular characteristic or set of characteristics should be mentioned.

Because of the design of MeSHe project, the validation study (Paper I) did not allow in-depth assessment such as inter-rater and test-retest reliability. In addition, exclusion of females from the validation study due to male gender predominance could have an effect on the results. Furthermore, the absence of clinical diagnoses in both the offenders and students sample may leave concerns about sensitivity and specificity of the instrument.

The study in Paper II was highly important due to the scarcity of psychiatric data collection and studies in developing countries; yet, several limitations could be reported. The relatively small sample size within each subpopulation could be argued to cause possible Type-II errors (for example, risk of false positives and false negatives) in analyses, and definitely limit the generalizability of the results, with only male participants being included, which prevented any gender-specific discussion of the results. Moreover, the existence of clinically assessed psychiatric diagnoses was self-reported and not gathered from in-patient registers; additionally, the study design (anonymous participation) didn't allow for follow-ups or merging of the collected data.

In Paper II, the assessment of outcomes (for example, living situation, education level, being a parent, employment) didn't include any structured measures, archive, or register information. It has been previously stated that such outcomes have been considered good indicators for adults (Helt *et al.*, 2008). Moreover, in Papers III and IV, assessment of parental alcohol problems did not offer the possibility of defining which parents would present this problem, and did not cover drug abuse. It is important to state that thank to these studies and to the realization of these limitations, the MeSHe project has modified its background questions and is available for international use in an improved form (MeSHe 2.0).

9 .Implications and future perspectives

We are the first study to present the validated Arabic version of an internationally well-known drug inventory self-report often used in research and clinical settings, the DUDIT. We are also one of the first researchers using DUDIT to investigate eventual gender differences in drug dependence.

However, even in the studies presented here, most of the analyses focused on male subjects due to the low number of female subjects. Further assessment focusing on females is required in order to acquire better insights regarding patterns of drug use among women and their direct and indirect consequences on the patients and their families.

The main aim of the MeSHe project, which provided data to this thesis, is to study cultural aspects of drug addiction and addiction treatments. Studied covariates of drug dependence in this thesis contribute to the rarely studied field of drug addiction in Morocco.

While the cross-sectional design and self-reported data collection of the MeSHe project limited causality analyses and conclusions, they also pointed to future perspectives and needs, where a focus on empirical and longitudinal studies should be placed. There is a need to establish adequate psycho-educational programs, to implement integrative treatments, and assure social support for addicts and their families. Even though the conceptualization of longitudinal studies can be expensive and logistically demanding regarding costs and time, they may reveal in-depth and more detailed results regarding the subject.

In Morocco, medical and psychological prevention centers are linked to associative work, mainly under the frame of risk reduction, psychosocial support, and employment integration for drug users. There is a need to increase the number of these outpatient care centers with qualified personnel in psychiatry, in order to be able to decrease the prevalence of drug use and dependence, consequently reducing the prevalence of addiction often coexisting with negative outcomes (such as criminality, chronic mental illness, self-harm behavior, and even early death), and most importantly reducing the pain and suffering of those affected.

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DUDIT — Drug Use Disorders Identification Test

ملف رقم |_|_|_|_|_|_|

هنا بعض الأسئلة حول المخدرات. الرجاء الإجابة بصدق وبشكل صحيح قدر المستطاع بالإشارة إلى الجواب الذي هو أفضل بالنسبة لك.

سن |___| ☐ رجل ☐ امرأة

4 مرات أو أكثر في الأسبوع	2-3 مرات في الأسبوع	2-4 مرات في الشهر	مرة في الشهر أو أقل	مطلقا	
☐	☐	☐	☐	☐	1. ما هو معدل تعاطيك لمخدرات أخرى غير الكحول؟ (عاين لائحة المخدرات خلفه)
☐	☐	☐	☐	☐	2. هل تستعمل أكثر من نوع واحد من المخدرات في نفس المناسبة ؟
7 أو أكثر	5-6	3-4	1-2	0	3. كم مرة تتعاطى للمخدرات في يوم مثالي لتعاطي المخدرات؟
☐	☐	☐	☐	☐	
يوميا أو تقريبا يوميا	كل أسبوع	كل شهر	أقل من مرة في الشهر	مطلقا	4. كم عدد المرات التي تأثرت فيها بشكل كبير بالمخدرات ؟
☐	☐	☐	☐	☐	
يوميا أو تقريبا يوميا	كل أسبوع	كل شهر	أقل من مرة في الشهر	مطلقا	5. هل شعرت خلال العام المنصرم برغبة قوية جدا لتعاطي المخدرات حتى انك وجدت نفسك لا تستطيع مقاومتها؟
☐	☐	☐	☐	☐	
يوميا أو تقريبا يوميا	كل أسبوع	كل شهر	أقل من مرة في الشهر	مطلقا	6. هل حصل خلال العام المنصرم، أن وجدت أنك لا تستطيع التوقف عن تعاطي المخدرات عند بدئك في التعاطي لها؟
☐	☐	☐	☐	☐	
يوميا أو تقريبا يوميا	كل أسبوع	كل شهر	أقل من مرة في الشهر	مطلقا	7. كم عدد المرات خلال العام الماضي، أخذت المخدرات ثم أهملت أن تقوم بعمل شيء كان يجب عليك القيام به ؟
☐	☐	☐	☐	☐	
يوميا أو تقريبا يوميا	كل أسبوع	كل شهر	أقل من مرة في الشهر	مطلقا	8. كم عدد المرات خلال العام الماضي، وجدت نفسك في حاجة إلى أخذ مخدر في الصباح الموالي بعد تعاطيك بشده للمخدر في اليوم السابق؟
☐	☐	☐	☐	☐	
يوميا أو تقريبا يوميا	كل أسبوع	كل شهر	أقل من مرة في الشهر	مطلقا	9. خلال العام الماضي، هل كان لديك شعور بالذنب أو تأنيب الضمير بعد أن تعاطيت المخدرات؟
☐	☐	☐	☐	☐	
نعم، أثناء العام الماضي	نعم، ولكن ليس في العام الماضي	لا			10. هل تعرضتم شخصيا أو أي شخص آخر لإصابة (جسدية أو نفسية) بسبب أنك تعاطيت المخدرات؟
☐	☐	☐			
نعم، أثناء العام الماضي	نعم، ولكن ليس في العام الماضي	لا			11. هل عبر أحد من الأقارب أو الأصدقاء، طبيب أو ممرضة، أو أي شخص آخر عن قلقهم بشأن تعاطيكم للمخدرات أو قالوا لك أنه يجب عليك التوقف عن استعمال المخدرات؟
☐	☐	☐			

اقلب الصفحة لرؤية لائحة المخدرات

لائحة المخدرات

(ملاحظة ! لا تشتمل الكحول !)

جي إتش بي وغيره	مواد الاستنشاق	المهلوسات	أفيونيات	الكوكايين	الأمفيتامينات	القنب الهندي
جي إتش بي المنشطات او المكملات الغذائية غاز الضحك (هالوثان) نيتريت الإميل مركبات مضادات الكولين	الدليو ثلاثي كلور الإيثيلين بنزين غاز محلول لصاق	إكستاسي (عقار النشوة) إل إس دي (عقار الهلوسة) المسكالين بي . سي . بي (الفينسيكليدين غبار الملائكة) البسيلوسيبين (الفطر السحري) دي إم تي (ثنائي ميثيل تريبتامين)	تدخين الهيروين هيروين أفيون	الكراك أوراق نبات الكوكا	ميثامفيتامين القات جَوزُ الكَوثَل (الفَوفَل)	المرخوانا حشيش زيت الحشيش

أقراص ـأدوية

تعتبرالأدوية كمخدرات عندما تستعمل :

- أكثر من اللازم أو أكثر مما وصفه الطبيب لك .
- في الحصول على متعة، أن تشعر بشعور جيد، الحصول على الشعور بالنشوة أو تساءلت ما نوع التأثير سيكون لها عليك .
- بعد الحصول عليهآ من قريب أو صديق .
- بعد سرقتهآ أو شرائها من "السوق السوداء".

الحبوب المنومة / المهدئات

إكوانيل تيميستا ستيلنوكس	ألبرازولام زانكس فاليوم نترازبام ميديزابين كلونازيبام ريفوتريل ايموفان

مسكنات الألم

مورفين ميانتالجيك	دوليبيران كودوليبيران اسبرين نورفلس سبازموفين تمجزيك ترامادول ترامال

لا تعتبر أقراص الدواء أو الأدوية من المخدرات إذا تم وصفها من طرف الطبيب أو تم أخذها وفقا للجرعات المحددة.

II

CrossMark

Psychometric Properties of the Arabic Version of the Drug Use Disorders Identification Test (DUDIT) in Clinical, Prison Inmate, and Student Samples

Anis Sfendla[1] · Btissame Zouini[1] · Dina Lemrani[1] · Anne H. Berman[2] ·
Meftaha Senhaji[1] · Nóra Kerekes[3]

Abstract

Purpose The study aimed to validate the Arabic version of the
Drug Use Disorders Identification Test (DUDIT) by (1)
assessing its factor structure, (2) determining structural valid-
ity, (3) evaluating item-total and inter-item correlation, and (4)
assessing its predictive validity.
Method The study population included 169 prison inmates,
51 patients with clinical diagnosis of substance used disorder,
and 53 students ($N = 273$). All participants completed the self-
report version of the Arabic DUDIT. After exploratory factor
analysis, internal consistency of the Arabic DUDIT was deter-
mined and external validation was performed.
Results Principal factor analysis showed that Arabic DUDIT
exhibited only one factor, which explained 66.9% of the var-
iance. Reliability based on Cronbach's alpha was .95. When
compared to the DSM-IV substance use disorder diagnosis in
a clinical sample, DUDIT had an area under the curve (AUC)
of .98, with a sensitivity of .98 and a specificity of .90.
Conclusion The Arabic version of DUDIT is a valid and reli-
able tool for screening for drug use in Arabic-speaking
countries.

Introduction

Research in the field of psychiatry, including substance use
disorders, is quite rare in the Arabic world, and Morocco is no
exception to this matter [1]. As Gaferi et al. [2] pointed out,
there is an increased need for published research within the
field of substance use from Arabic-speaking countries, where
despite cultural, social, and/or religious facets, global reports
indicate an increasing prevalence of mental illness in this field
[3] possibly as a consequence of rapid development and mod-
ernization [2, 4, 5]. According to the latest report by the
International Narcotics Control Board (2014) [6], Morocco
(beside Afghanistan) is still the largest producer of cannabis
resin in the world, supplying the illicit markets of western and
central Europe and North Africa. This fact raises the obvious
point that Morocco might also be one of the leading countries
in terms of drug use or at least cannabis use. However, the
prevalence of substance abuse among citizens aged 15 years
and above, in the years 2004 and 2005, was 5.8% according
the nationwide survey on mental health and drug addiction
carried out by Morocco's Ministry of Health [7]. This rate is
1.6 times lower than that measured in the USA [8]. A recent
study concluded that young adults' involvement in substance
use in Morocco was substantially lower than the correspond-
ing rates in Europe or the USA [9]. Importantly, these studies
used the European ESPAD survey [10] and the Mini
International Neuropsychiatric Interview (MINI) [11], respec-
tively, to collect data about the prevalence of drug use/abuse.
In order to be able to compare data about the true prevalence
of drug use in Arabic-speaking countries to other international
information, we need validated and reliable instruments with

✉ Nóra Kerekes
    nora.kerekes@hv.se

1   Department of Biology, Faculty of Sciences, Abdelmalek Essaadi
    University, Tetouan, Morocco

2   Department of Clinical Neuroscience, Center for Psychiatry
    Research, Karolinska Institutet, Stockholm, Sweden

3   Department of Health Sciences, University West,
    Trollhättan, Sweden

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good psychometric properties. Only then will we be able to discern the underlying reasons of discrepancies in this global matrix.

The early identification of individuals with drug problems and evaluation of treatment strategies requires valid and reliable screening instruments. Several of these instruments have focused on substance use and related constructs [12, 13]. Some of the most frequently used instruments for these purposes are the Drug Abuse Screening Test (DAST) [14], the CAGE-AID (Cut-down, Annoyed, Guilty, Eye-opener–Adapted to Include Drugs) [15], the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) [16], and the Drug Use Disorders Identification Test (DUDIT) [17].

The DUDIT is one of the newest members in the above list of screening instruments. It was developed with the specific aims of assessing usage patterns and related problems, as well as identifying the risk of harmful use or dependence according to DSM-IV and ICD-10 by collecting information about drug intake and associated problems. The DUDIT has been used in European countries, such as Sweden, from where it originates [18, 19]; Norway [20, 21]; Hungary [22]; and the Netherlands [23, 24] but also used outside Europe, in the USA [25, 26], South Africa [27], and Turkey [28, 29]. In the original publication on the DUDIT, Berman and colleagues [17] showed that the instrument has good psychometric properties, such as high internal consistency both in clinical (Cronbach's alpha .80) and in general populations (Cronbach's alpha .93). Several studies have confirmed the strong validity of the DUDIT for assessing drug-related risk behavior and/or addiction in various samples. These samples include the general population [22, 26, 28], prisoners [17], probationers [23], offenders with mental health problems [18], patients with substance use disorder (SUD) [30] or with a diagnosis of psychosis [21], and in samples of adolescents and school-attending youths [24, 27]. With this background, the present study aims to validate and establish the psychometric properties of the Arabic version of DUDIT with the help of a clinical sample (where DSM-IV diagnoses are available), a prison sample (where substance use often companies criminal behavior), and a student sample (where the risk of substance use disorder is minimal).

Subjects and Methods

During July 2013 and July 2014, we collected information about somatic and mental health in defined samples of Moroccans using the "Mental and Somatic Health without borders" (MeSHe) survey. The MeSHe survey, constructed by the project leader and co-author (NK), focuses on somatic and mental health profiles coupled to substance use and aggressive behavior in different countries. Alongside questions about background information such as age and education and

a variety of health-related and demographic questions, the Arabic version of the MeSHe survey includes the Arabic version of DUDIT, produced in cooperation with the original developers of this instrument at Karolinska Institute, Stockholm, Sweden. In Morocco, participants were recruited from three different settings with various pattern of drug use: (a) substance-dependent out-patients from a medical and psychological prevention center, (b) inmates with high possibility of their criminal behavior coexisting drug use problem, and (c) high school students with possible no drug use problem; each samples helping in the assessment of the discriminative validity of the DUDIT. Participation of the MeSHe study is always voluntary and involves the anonymous completion of the survey as self-reported questionnaire. In average (across all subsamples), the completion of the whole MeSHe survey took about 45 min.

Study Populations

Clinical Sample

The sample of 61 substance dependent patients was recruited from the medical and psychological prevention center in Tangier, Morocco. Participation was 100% from this center which is operating on an outpatient basis. Based on clinicians' assessments, all participants met the DSM-IV criteria for substance use disorder (SUD). It should be noted that no differential diagnoses were provided for research due to patient–doctor confidentiality. The number of female subjects ($n = 7$) in this clinical sample was too low to be able to perform any reliable statistical analysis, which would have been necessary based on the previously published gender sensitivity of DUDIT. Therefore, only male subjects ($n = 54$) were included in the present study. This sample had a mean age of 38.37 (SD = 8.29, min = 19 max = 56), the mean education dropout age was 15.55 (SD = 4.66), 72.2% achieved elementary or secondary school, 22.2% completed high school, 3.7% achieved higher education, and 1.9% were unable to achieve any qualification. A total of 59.3% of the patients were unemployed.

Prison Sample

Data were collected from the male prison institution in Meknes, Morocco. Random recruitment, assured by the prison administration, was performed with exclusion of those who lacked the academic skills required to understand and answer the Arabic questionnaire. The initial sample size included 177 prisoners. Eight respondents (4.5%) were excluded due to missing information about their age, resulting a final sample of 169 inmates, which is approximately 7% of the prisoners who were incarcerated during the specific period the data

collections took place. This sample had a mean age of 30.88 (SD = 10.66, min = 15 max = 92). The mean education dropout age was 17.75 years (SD = 3.76); 44.4% successfully achieved elementary or secondary school, 33.1% completed high school, 20.1% achieved higher education, 1.2% did not achieve any qualifications, and 1.2% were coded as missing. Employment status showed that 18.9% of respondents were unemployed.

Students

Students from the "Sharif IDRISSI" high school in Tetouan, Morocco, were also asked to reply anonymously to our survey. Previously, the high school's parents association approved the use of the survey based on anonymous and voluntary participation. At each grade (first, second, and third grades), there were four classes in the school, of which two were randomly selected to participate in the study. In each class, the study was thoroughly explained, and the voluntary and anonymous participation was emphasized. A member from the researcher team and co-author (BZ) was present in the classes while students completed the survey. No clinical backgrounds were available for this sample. Ninety-six students returned the questionnaire (representing 56.5% of the entire student population of these six classes). In the present analyses, only male subjects ($n = 53$) were included, with a mean age of 17.26 (SD = .68).

Measures

The DUDIT is a screening instrument composed of 11 items identifying consumption patterns and different problems related to the use of drugs in general or clinical populations. The scoring of DUDIT is based on two approaches: items 1 to 9 are scored on a five-point Likert scale, while items 10 and 11 are scored on three-point scale. The DUDIT score is calculated by summing the scores on all items, engendering a maximum score of 44 points. Cutoffs for screening of drug-related problems (≥6 for man) and of drug dependence (≥25 points) were established in the original Swedish version of the questionnaire [17].

Official Translation of DUDIT

The translations were performed in two steps: the first step was to translate DUDIT from English to Arabic, and the second step was a back-translation by an independent translator from Arabic to English. In 2014, after several adjustments, the developer (Berman and colleagues) approved a final version of the Arabic DUDIT, which is now downloadable at http://www.

emcdda.europa.eu/attachements.cfm/att_236059_EN_ DUDIT_Arabic_final.pdf.

Ethical Considerations

The present study is in agreement with the Helsinki declaration. All participants received a written and oral presentation of the study and its aims. They were assured that their answers would not have any effect on their present sentence (in prison), treatment plan (in clinical population), or academic performance (students) and that no responses could be traced back to the individual level. All answers were recorded on an anonymous response sheet. Those who were not willing to participate could simply leave or not enter the questionnaire room, which provided a private, peaceful environment for answering the "Mental and Somatic Health without borders" (MeSHe) survey.

Statistical Analysis

Sample characteristics were described via the use of descriptive statistics, including means and standard deviation. Principal factor analysis with oblique rotation was used to assess the internal structure of the instrument; the factorability of the data was assessed simultaneously by Bartlett's test of sphericity and the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy. Internal reliability was tested using Cronbach's alpha coefficient; we also included inter-item, total item, and item-rest correlations (IRC). We have followed George and Mallery (2003) rules of thumb for interpretation of the alpha values:" ≥ .9 = Excellent, ≥.8 = Good, ≥.7 = Acceptable, ≥.6 = Questionable, ≥.5 = Poor, and ≤.5 = Unacceptable" (p. 231) [31]. For the interpretation items' factor loading, the following rules very applied: " ≥.7 = Excellent, ≥.6 = Very good, ≥.5 = Good, ≥.4 = Fair, ≥.3 = Poor" (p. 649) [32]. External validation was performed by the Mann–Whitney U test to analyze the difference between the clinical sample and young adults. Effect size (r) was calculated between young adult and clinical samples by dividing the Z values by the square root of n (number of cases), while Cohen's criteria [33] for effect sizes were applied. Logistic regression was undertaken using group membership (dichotomous variable: clinical sample and young adults) as the dependent variable and the DUDIT score as the predictor variable in a model. We then used the receiver operating characteristic (ROC) analysis to evaluate sensitivity, specificity, and cutoff scores. The AUC and the ROC curve were defined to assess validity of the instrument by comparing the DUDIT scores with DSM-IV diagnosis of substance use disorder. A logistic regression model was used to determine the predictive capacity of the DUDIT scores (independent variable) to

identify dichotomous group membership category (dependent variable where existing SUD diagnosis is coded as 1 and the non-existing SUD diagnosis is coded as 0). All statistical analyses were executed by SPSS for Windows version 21.0.

Results

Factorial Validity

The 11 DUDIT items were subject to principal factor analysis and an assessment for suitability of data was performed. The resulting Kaiser–Meyer–Olkin value was .93, while Bartlett's test of sphericity reached statistical significance, supporting the factorability of data. Further, the scree plot revealed a break just after the first factor with an eigenvalue >1 (7.36), explaining 66.9% of the variance. The following eigenvalue was .75 and accounted for just 6.81% of the total variance. Factor loadings for all items ranged from .66 (item 10) to .87 (item 1) (see Table 1).

Internal Consistency

Cronbach's alpha was calculated for DUDIT in the total study population, showing excellent internal consistency (.95). The Cronbach's alpha coefficient was also calculated within each group, proving a stable and strong correlation between the items in each sample (.94 in the inmates' sample, .89 in the clinical sample and .94 in the young adults). The range of item-total correlations was between .70 and .88. Additionally, item-rest correlations were all above .65, which shows that items highly correlate with the scale. Table 2 displays the inter-item, total item, and item-rest correlations.

Predictive Validity

The mean DUDIT score for the clinical sample diagnosed with SUD ($N = 54$) was 24.54 (SD = 12.05); this was significantly ($p < .001$) higher than in the young adult sample with no clinical SUD diagnosis ($N = 53$) ($M = 1.34$; SD = 4.43, $U = 64.000$). The difference had a large effect size (Cohen's $r = .85$). A logistic regression model predicting group membership (SUD or no SUD) was statistically significant ($\chi2$ (1, $N = 107$) = 93.52), indicating that the reported DUDIT score correlated highly with the existence of a SUD diagnosis. The overall model explained between 58.3% (Cox and Snell R square) and 77.7% (Nagelkerke R squared) of the variance of group membership and showed that the DUDIT score was effective in terms of correctly classifying the clinical sample with SUD and individuals without existing SUD in 88.8% of cases. Predictive validity was examined using ROC analysis, where AUC reached .98 ($p < .001$, CI = .95–1.00) (Fig. 1).

Optimal sensitivity and specificity (.98 and .90, respectively) matched a cutoff score of 3 (Table 3).

Discussion

This study has shown that the Arabic translation of DUDIT has a high validity and reliability to identify individuals with substance use/abuse in Arabic-language samples.

In matters of factorial validity, the one factor solution revealed by principal axis factoring supports the statement that the Arabic version of the DUDIT assesses a one-dimensional construct. The factor loading ranged between "very good" and "excellent." All items loaded highly in the main factor, and those most strongly correlated with it concerned the frequency of substance use (items 1 and 3), developing dependence (item 5), uncontrolled use (item 6), and physical and psychological discomfort (items 8 and 9). A similar one-factor construct was previously identified in the Turkish, Dutch, and American validation studies [23, 26, 29]. The original Swedish study among a sample of drug users suggested a three-factor solution, whereas only two factors were reported in the general population [17]. Other validation studies also showed a two-factor structure [22, 28]. The present study is the fourth (after the Turkish, Dutch, and American studies) to find a one-dimensional construct of the instrument. The main similarities between these four studies were sample characteristics such as male gender predominance and relatively heterogeneous samples including SUD patients and inmates. Among these four studies, the country with highest GDP (gross domestic product) per capita was the USA, followed by the Netherlands, Turkey, and finally Morocco [34]; these countries also have strong cultural differences and differing attitudes to drug use and treatment of addiction.

Generally, the Arabic version of the DUDIT showed excellent reliability and high external validity, and psychometric properties were similar to those previously reported for other language versions [17, 21–23, 27, 29, 30]. Internal consistency calculated for the total study population, as well as for the separate samples, revealed excellent reliability (Cronbach's alpha close to or above .90), in accordance with previous findings [22, 24, 26, 28–30]. Predictive validity based on ROC analysis also showed excellent results. The AUC of .98 reflects a high concurrent validity and indicates an ideal fit between the DUDIT score and the DSM-IV diagnosis; this indicates that the DUDIT can be considered "excellent" at separating drug users from non-drug-users. In order for a screening instrument to be considered clinically useful, sensitivity and specificity values must be above .80 [35]. The optimal sensitivity and specificity were coupled to a cutoff value of 3 (sensitivity .98 and specificity .90). This is lower than the value reported by Berman et al. [17] in a Swedish cohort sample (cutoff for defining drug addiction ≥25, with a

Table 1 Factor loadings for DUDIT items ($N = 240$)

	DUDIT	Factor 1
1	How often do you use drugs other than alcohol?	.86
2	Do you use more than one type of drug on the same occasion?	.68
3	How many times do you take drugs on a typical day when you use drugs?	.82
4	How often are you influenced heavily by drugs?	.79
5	Over the past year, have you felt that your longing for drugs was so strong that you could not resist it?	.83
6	Has it happened, over the past year, that you have not been able to stop taking drugs once you started?	.82
7	How often over the past year have you taken drugs and then neglected to do something you should have done?	.78
8	How often over the past year have you needed to take a drug the morning after heavy drug use the day before?	.85
9	How often over the past year have you had guilt feelings or a bad conscience because you used drugs?	.86
10	Have you or anyone else been hurt (mentally or physically) because you used drugs?	.66
11	Has a relative or a friend, a doctor or a nurse, or anyone else, been worried about your drug use or said to you that you should stop using drugs?	.79

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sensitivity of .90 and a specificity of .88), but comparable to the value found in a Hungarian sample [22] (cutoff for defining drug addiction ≥ 2.1, with sensitivity of .95 and specificity of .81). It is important to point out that the original article [17] with the cutoff of 25 or more referred to DSM-IV/ICD-10 diagnoses based on a full diagnostic interview. The original Swedish study was conducted in samples of hospitalized or incarcerated subjects suffering from drug abuse or addiction,

while Matuszka et al. [22] and other authors (including the present study) worked with a study population that included less severe substance use problems and referred to problematic drug use including hazardous and harmful use. In our study, each of the patients in the clinical sample had a SUD diagnosis based on DSM-IV criteria, but we did not have enough information to be able to differentiate subgroups according to the severity of drug abuse. The cutoff would obviously be much

Table 2 Inter-item, total-item, and item-rest correlations (IRC) for DUDIT ($N = 240$)

DUDIT items	1	2	3	4	5	6	7	8	9	10	11	IRC
1 How often do you use drugs other than alcohol?	1											.84
2 Do you use more than one type of drug on the same occasion?	.65	1										.66
3 How many times do you take drugs on a typical day when you use drugs?	.80	.69	1									.80
4 How often are you influenced heavily by drugs?	.74	.57	.66	1								.77
5 Over the past year, have you felt that your longing for drugs was so strong that you could not resist it?	.68	.47	.63	.64	1							.81
6 Has it happened, over the past year, that you have not been able to stop taking drugs once you started?	.62	.52	.65	.66	.75	1						.79
7 How often over the past year have you taken drugs and then neglected to do something you should have done?	.61	.54	.63	.56	.72	.72	1					.75
8 How often over the past year have you needed to take a drug the morning after heavy drug use the day before?	.68	.58	.71	.63	.73	.81	.71	1				.83
9 How often over the past year have you had guilt feelings or a bad conscience because you used drugs?	.78	.54	.66	.69	.69	.67	.65	.70	1			.84
10 Have you or anyone else been hurt (mentally or physically) because you used drugs?	.59	.43	.44	.58	.57	.50	.44	.53	.64	1		.65
11 Has a relative or a friend, a doctor or a nurse, or anyone else, been worried about your drug use or said to you that you should stop using drugs?	.69	.46	.63	.58	.70	.60	.60	.67	.77	.59	1	.77
DUDIT score	.88	.72	.84	.82	.84	.83	.79	.86	.88	.70	.82	

All correlations are significant at $p < .001$

DUDIT Drug Use Disorders Identification Test

Fig. 1 Receiver operating characteristic (ROC) curve for DUDIT score (independent variable) and group membership (dependent variable). Area under the curve (AUC) was .98 ($p < .001$, CI = .95–1)
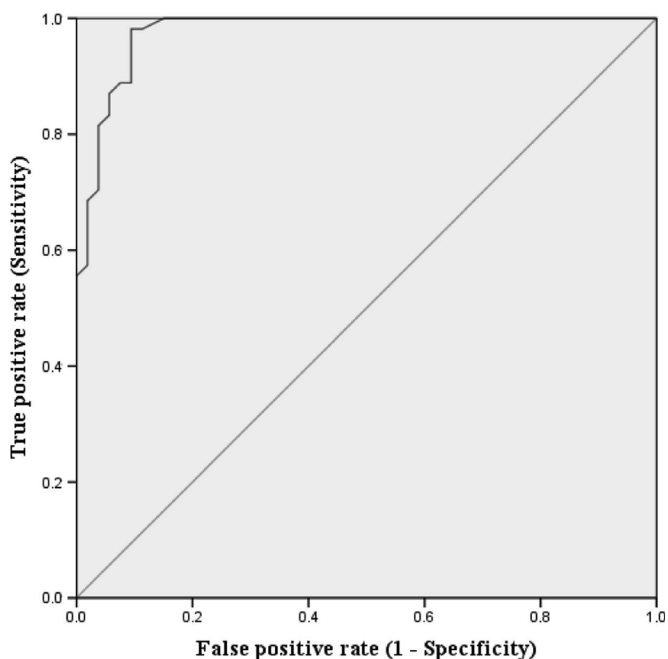
lower for hazardous and harmful use than for dependence or abuse. This important difference in the study populations is reflected in the mean scores in DUDIT. While students had very similar mean scores in both the Hungarian and the present Moroccan sample (1.39 and 1.34, respectively), we found clear differences in our clinical samples. The mean score of

Table 3 Specificity, sensitivity, and cutoff scores for the DUDIT ($N = 107$)

Cutoff scores	Sensitivity	Specificity
1	1	.42
2	.99	.87
3[a]	.98	.90
4	.94	.91
5	.89	.92
6[b]	.88	.93
7	.86	.94
8	.84	.94
9	.82	.95
25[c]	.28	1

[a] Optimal sensitivity and specificity in the Arabic DUDIT for identification of drug dependence

[b] Suggested cutoff for drug-related problems [17]

[c] Suggested cutoff for drug dependence [17]

the clinical sample on DUDIT was the lowest in the Hungarian sample ($M = 14.07$ for mandatory drug treatment program participants and $M = 17.71$ for outpatient treatment program participants) [22], followed by that in the Moroccan SUD sample ($M = 24.5$) and the original Swedish report (32.7 points) [17]. One explanation of this is that the low cutoff score could be due to the differences in sample characteristics. The low cutoff could also reveal eventual cultural differences in attitudes to drug abuse and addicts, and emphasize the need for nationally validated drug inventories.

In our clinical sample, seven patients had between two and six points on the DUDIT, which should be impossible considering that each of these patients had a SUD diagnosis according DSM-IV and that they were hospitalized for their drug use problem. However, because the study was a validation of a self-report instrument, we did not exclude those persons from the analyses. Self-report as a method includes the possibility of misunderstanding the questions and the possibility of "under-scoring" based on shame or fear of admitting the truth about something (drug use, in our case). This is supported by the fact that when we use the suggested cutoff (≥3 points) to select those with drug use problems in our student sample (in average 17 years old), six students (11%) were identified. This rate is comparable to Swedish ninth-class boys (on average 15 years old), where 7% of whom reported use of narcotics [36].

Limitations

This study has certain limitations. One is the exclusion of females in the study due to male gender predominance, which could have an effect on the results. Even though it can be useful and acceptable to only report results for males, further assessment focusing on female gender is required in order to acquire better insight regarding patterns of use among women. Furthermore, the absence of clinical diagnoses in both offender and student samples raises concerns about sensitivity and specificity of the instrument; future studies on predictive validity in a clinically diagnosed sample are highly recommended.

Conclusion

The Arabic version of DUDIT has excellent reliability and high validity. These psychometric properties justify the use of this instrument for drug use assessment and for testing the treatment process in different settings, making it simple for clinicians and researchers to collect data from targeted groups. Moreover, our findings emphasize the need to investigate the cultural aspects of mental ill health and the use of locally adapted and validated measures in research.

Compliance with Ethical Standards

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