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SPECIAL SECTION: Theodore Millon's Legacy for Personality Theory and Assessment

International Adaptations of the Millon Clinical Multiaxial Inventory: Construct Validity and Clinical Applications

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This article examines the influence of the Millon Clinical Multiaxial Inventory (MCMI) as a clinical and research instrument beyond the borders of the United States. The MCMI's theoretical and empirical grounding, its alignment with the *Diagnostic and Statistical Manual of Mental Disorders (DSM)*, and scales that can be interpreted both categorically and dimensionally, are the primary features that make the test attractive. We begin with studies that evaluated the construct equivalence of the different language adaptations. Data from the most widely researched non English-language forms (Danish, Dutch, and Spanish) show excellent comparability with Millon's original. Nevertheless, significant problems were noted in efforts to create clinical groups that would allow for equivalence of diagnostic accuracy when using the cutoff scores. Although dimensional aspects of the scale scores were not affected by this, the adapted measures might show attenuated diagnostic accuracy compared with Millon's original. Next, we present MCMI studies conducted in clinical settings to document where the adapted tests have made their greatest impact in the international literature. A wide variety of clinical applications demonstrated broad utility, and given the high number of issues addressed, we think Millon's influence will certainly stand the test of time in different domains and settings.

This article focuses on the operationalization of Theodore Millon's theory (e.g., 1969/1983, 1986; Millon & Davis, 1996) into adult clinical assessment; namely, on the influence of the Millon Clinical Multiaxial Inventory (MCMI; Millon, 1977) as a clinical and research instrument beyond the borders of the United States. Until now, three English-language editions have been published (MCMI-I, MCMI-II, MCMI-III), all of which have been translated and adapted for use in foreign countries.

The MCMI-I was first published in 1977 to measure the pathologies of personality formulated in Millon's (1969/1983) original theoretical model. At the time Millon was involved in developing the third edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-III)*; American Psychiatric Association, 1980). He played a pioneering role by introducing the idea to place personality disorders (PDs) on a separate axis so that sufficient clinical attention would be given to personality pathology. He developed the MCMI-I to be consonant with *DSM-III* nosology and grouped its scales into categories of personality and clinical syndromes (CSs) to reflect the distinction between Axis II and Axis I.

After publication of the *DSM-III-R* (American Psychiatric Association, 1987) Millon revised his instrument (MCMI-II; Millon, 1987) to incorporate scales for two new, provisional PDs (i.e., self-defeating and sadistic). The test was also updated to reflect changes in Millon's model (Millon &

Klerman, 1986), and a number of psychometric changes were introduced. The PD and CS scales were lengthened by adding items and expanding their maximum weighted value from 2 to 3, and a number of corrections were applied to the standardized base rate (BR) scores to compensate for response biases.

The MCMI-III was released in 1994 in conjunction with the fourth edition of the *DSM (DSM-IV)*; American Psychiatric Association, 2000). The test was updated to stay abreast of changes in the diagnostic manual and Millon's (Millon & Davis, 1996) model. In this regard a posttraumatic stress disorder (PTSD) scale was added to measure the *DSM-IV* trauma syndrome, and three PD scales were renamed: Aggressive became Sadistic, Passive-Aggressive became Negativistic, and Self-Defeating became Masochistic. Psychometric refinements included improved item wording, shorter scales, and a return to the simpler (1 vs. 2) item-weighting system used with the MCMI-I. In 2009, Millon restandardized the MCMI-III BR scores using a combined-gender norm sample of approximately 1,000 men and women, replacing the previous system of calculating BR scores separately for men and women. He also added a set of Grossman facet scales for the PDs and introduced an Inconsistency index to aid in assessing profile validity.

The MCMI-IV is currently in development, with the same goals for revision as its predecessors. *DSM-5* combines AXIS I, II (and III) into one list that contains all mental disorders, including PDs. Significantly, the MCMI-III's scales remain compatible with the recently published *DSM-5* (American Psychiatric Association, 2013), as categorical diagnosis of PDs was retained in Section II, and no new PDs were introduced.

Clinicians and researchers outside the United States have shown strong interest in the MCMI since the early 1980s. It is

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a relatively short test (175 items) yet provides scales for all *DSM* PDs and several CSs. Practitioners like that it is normed on psychiatric patients rather than normal adults, and researchers appreciate its close alignment to the *DSM*. Both value its grounding in Millon's (Millon & Davis, 1996) clinical science model that integrates evolutionary principles, theory, assessment, and treatment. The guiding principle for the MCMI is that it should be "empirically grounded and sufficiently sensitive quantitatively to enable the theory's propositions and hypotheses to be adequately investigated and evaluated and the categories comprising its nosology to be readily identified (diagnosed) and measured (dimensionalized), specifying therefrom target areas for interventions" (Millon, 1999b, p. 440). The many foreign-language adaptations of the test illustrate the influence of the theory and *DSM* constructs across borders, and contribute significantly to a growing research basis.

Another feature of the MCMI that is valued equally by clinicians and researchers is that its test scales can be interpreted both categorically and dimensionally. To alert users that a patient is likely to meet *DSM* criteria for a particular disorder, Millon created cutoff points for scales at BR 75 and BR 85 that are anchored to the prevalence of each disorder in a general psychiatric population. In contrast to norm-referencing, such as T scores, BR scores are a method of criterion referencing and take the prevalence of the attribute being measured into account. For example, among PD measures, BR > 85 was tied to the disorder prevalence rate in the normative sample, and BR \geq 75 to the trait level. Millon and Davis (1996) interpreted the *DSM* categories (e.g., Schizoid) as personality prototypes. Dimensional traits (e.g., sociability) are subcomponents and form the building blocks of the prototypes. Because the prototypes exist out of these continuously distributed traits, PDs can be assessed dimensionally as well as categorically. Such an approach has been incorporated in the hybrid *DSM-5* model, included in Section III (American Psychiatric Association, 2013), that introduces emerging measures and models to assist clinicians in their evaluation of patients.

RATIONALE FOR SELECTION OF TESTS AND STUDIES COVERED BY THIS REVIEW

Prior to assessing the quality of studies employing translations of the MCMI, a first step is to determine whether the translation procedure followed accepted protocol, such as the International Test Commission (ITC) guidelines for translating and adapting tests (ITC, 2005). Then, after initial data collection (e.g., on scale reliability), a second important step is to demonstrate construct equivalence of the translation to the original version. Construct equivalence can involve different forms of validity like structural invariance, convergent validity, and discriminant validity. Structural invariance is often corroborated if the same underlying dimensions are found on the basis of factor analyses. A next logical step is exploring the nomological network of the instrument. A final issue is whether studies on normative data are available to demonstrate that the likely meaning of scores (e.g., anchor points for categorical diagnosis) is comparable to the original test. Therefore, the first half of our report evaluates the construct validity of the different MCMI translations. In the second half we examine research on clinical applications of the MCMI to assess where the adapted measures have made their greatest impact.

Our focus is on international adaptations of foreign-language translations of the MCMI with data sampled outside the United States. Therefore, studies conducted with the original language version, even when conducted outside the United States, were excluded. Likewise, we omitted studies that addressed international applications within the United States (e.g., studies of Hispanic Americans). Further, we only included studies published as journal articles, books, or book chapters.

For our literature search we consulted the following databases: PsycINFO (for publications in the period of 1806–August 20, 2014), and PubMed (for publications in the period of 1966–August 20, 2014) using the keywords MCMI, MCMI-I, MCMI-II, and MCMI-III. We screened the "MCMI-III Bibliography List 2007" from the Web site of Pearson (2007), the main publisher of the MCMI. We also searched Google Scholar, using as key words several author names known to us as having translated or studied the MCMI, and we contacted several authors by e-mail asking for lists of their publications.

CONSTRUCT VALIDITY OF THE TRANSLATIONS

The Danish, Dutch, and Spanish MCMI versions are the most researched adaptations. Amazingly, only the Danish and Spanish versions are currently published by Pearson Assessments. Although the Dutch version was extensively validated, Pearson declined to publish it and would not permit another publisher to do so.

Danish Translation

MCMI-I. The Danish MCMI-I was among the first adaptations of a Millon instrument outside the United States (Simonsen, 2005; Simonsen & Elklit, 2008; Simonsen & Møllergård, 1986). Simonsen and colleagues applied a back-translation procedure to ensure that the Danish items and instructions would mirror those of the English-language test. To validate the linguistic accuracy of the translation, the researchers created two independent Danish versions and then pilot tested them in a population survey of elderly community-dwelling Danes residing in Copenhagen (Simonsen & Mortensen, 1990). In total, 66 women and 63 men participated. Comparison of the two versions revealed that only 6 of 175 items had significant differences on important psychometric indexes (e.g., item endorsement frequencies and item-total scale correlations). A revised test combining the best items from the two versions was evaluated in a study of 423 psychiatric patients and 179 normal controls (Mortensen & Simonsen, 1990). Internal consistency estimates (Kuder-Richardson formula 20) for all scales in the total Danish sample were in close agreement with the original U.S. values (range = .70–.95; Millon, 1982). Congruency coefficients with U.S. factors were not calculated, but a factor analysis at the scale level revealed three dimensions that were very similar to those reported for the English-language MCMI-I: general maladjustment, extraversion, and psychoticism (Simonsen, 2005, pp. 398–399). The same sample was used for Rasch analysis (Kreiner, Simonsen, & Mogensen, 1990). After deleting some biased and heterogeneous items, homogeneity was reached for the CS and severe PD scales, but not the basic PD scales. The

measures became homogeneous only at the higher end of the score distribution (i.e., for those respondents endorsing the most severe disorders). This finding corresponds with clinical impressions that patients with severe illnesses are perhaps more alike and easier to distinguish than patients with less severe psychopathology. It also supports Millon's contention that MCMI scale scores less than BR 75 are not useful for making clinical diagnoses.

MCMI-II. Soon after publication of the MCMI-II (Millon, 1987) Simonsen and colleagues began work on a Danish-language version of the test using the same methodology they employed for adapting the MCMI-I. The dramatic changes introduced by Millon for constructing the MCMI-II scales (i.e., items for each scale were at least doubled and weights were increased from 2 to 3) resulted in a problematic scoring system for the Danish test. Simonsen and Mortensen (1990) found that changes in MCMI-II PD scale scores after psychological treatment did not reflect real personality change, but rather symptomatic state changes. A pre-post treatment study of 236 outpatients undergoing psychodynamic group therapy found that, when depression was used as a covariate, only the MCMI-II Dependent scale yielded significant differences. When depression was not controlled for, several PD scale scores changed (Jensen, Mortensen, & Lotz, 2008). Little additional work was done with the Danish MCMI-II because Millon published a new version of his test (MCMI-III; Millon, 1994) just 7 years after introducing the MCMI-II. Notably, improved scoring procedures were introduced that reduced the number of items for each scale by half (or more), and the item weights from 3 to 2.

MCMI-III. The Danish MCMI-III (Simonsen & Elklit, 2008) was developed using the same methods employed for previous versions, and field tested in a sample of 2,205 psychiatric patients (59.6% female). Scale scores were examined for gender and age-related differences. Men tended to score higher than women on most scales, with the exception of Desirability, Dependent, Sadistic, Masochistic, Paranoid, Bipolar:Manic, PTSD, and Major Depression scales, where no differences were found. Age was negatively correlated with all MCMI-III scales except Desirability, Histrionic, and Compulsive. Regression analyses found that age was a strong predictor of the PD scales, whereas gender was a strong predictor for many CS scales. Furthermore, patient group (based on treatment type) had an effect on a number of scales, similar in scope and magnitude to gender and age. Correlations of the Danish scales with those of Millon's (1997) original test showed a very high degree of concordance. Moreover, Cronbach's alphas were in the same range. Interitem correlations for the Danish MCMI-III averaged .23 for the PD scales and .27 for the CS scales, reflecting an optimal range of variation. Also, the standard errors for scales were very small, indicating high precision of measurement. A factor analysis resulted in four factors—emotional instability, impulsive aggression versus constraint, extraversion versus introversion, and paranoid/delusional thinking—that are comparable to those found for the English-language test (Craig & Bivens, 1998; Haddy, Strack & Choca, 2005). Congruency coefficients for the Danish and U.S. factors were not reported.

As far as we know, there is just one study (Hesse, Guldager, & Linneberg, 2011) addressing the convergent validity of the CS scales of the Danish MCMI-III. In this study, 186 substance-abusing patients were assessed with the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1997), Montgomery-Asberg Depression Rating Scale (Montgomery & Asberg, 1979), and the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988). The Alcohol Dependence, Drug Dependence, Major Depression, and the Delusional Disorder scales converged well with corresponding scales from the MINI and Depression Rating scales, and also demonstrated good divergent validity. The BAI was correlated with the Anxiety Disorder scale but also highly correlated with other psychiatric symptoms, thus showing poor discriminant validity. Furthermore, a factor analysis of the external validity measures only yielded a superordinate factor representing mental health problems that was significantly correlated with the MCMI-III CS scales. Finally, using area under the curve (AUC) analyses (or the probability that a randomly selected person from the disordered population will have a higher scale score than a randomly selected person from the nondisordered population) with individual MCMI-III scales as predictors of categorical MINI diagnoses, all AUC curves were significant and had higher AUC values than a study on the original U.S. data (Hsu, 2002), except for Alcohol Dependence. However, categorical agreement between the MINI and individual MCMI-III scales remained poor.

Conclusion. The Danish translation method employed by Simonsen and colleagues yielded faithful adaptations of all three editions of the MCMI. Psychometric properties of the Danish test scales were very similar to those of the U.S. originals. Factor analyses resulted in similar underlying dimensions, yet structural invariance with the U.S. factors was not empirically corroborated. The nomological network of the Danish MCMI-III version needs further research given the limited number of studies, and no information is available for the PD scales. The scales do have predictive validity (significant AUC curves), but further testing is needed to verify diagnostic hit rates.

Dutch Translation

MCMI-I. Hedwig Sloore, a pioneer in Belgian assessment psychology, created the first Dutch-language translation of the MCMI-I in the mid-1980s (Rossi, Sloore, & Derksen, 2008). Four psychologists independently translated the test items from English, and disagreements were resolved among the translators with help from a linguist (Simonsen, 2005). Although methods for collecting early psychometric data were never published, we evaluated the success of Sloore's endeavor from studies that used his instrument. Simonsen (2005) compared the MCMI-I results of 427 patients who completed the Belgian form with data from patients completing the Danish MCMI-I. Results from both measures were further compared to results from the original test (Millon, 1977). Internal consistency estimates for Belgian, Danish, and U.S. PD scales were similar, although the Belgian test showed lower internal reliabilities for the Histrionic (.64) and Antisocial (.62) scales compared with the other versions. The first three factors extracted from the Belgian, Danish, and U.S.

samples appeared to be quite similar, but the invariance was not statistically tested.

An initial attempt to construct BR scores with diagnostic hit rates comparable to Millon's (1977) test was made using data from 358 Belgian patients (Sloore & Derksen, 1997). Toward this end patient groups were formed based on diagnosis and MCMI-I data to model (anchor) the score distributions that would be used to set the diagnostic cutoff points of BR 75 and BR 85. Unfortunately, for 13 of 20 scales the median values of the BR 75 group were higher than those for the BR 85 group, opposite of what was expected. An independent study completed with the Belgian MCMI-I concluded that stability of the PD scale-score profiles was problematic (Vereycken & Quina, 1993).

In the Netherlands, Luteijn (1990) developed his own Dutch-language translation of the MCMI-I. He did not use a back-translation procedure. Independent translations were made by students, then discussed and checked for meaning by a bilingual clinical psychologist. Unfortunately, the published report only included data from the PD scales. The MCMI-I was completed by a heterogeneous group of psychiatric patients ($N = 254$, 52% female, 50% inpatients) and adults from a community sample ($N = 600$, 61% female). Median Cronbach's alphas for the scales were somewhat lower than for the U.S. version (.79 for Dutch patients vs. .84 in the U.S. sample), although scale-by-scale comparisons were not possible because only the range was reported (.68–.93 for the patient sample and .61–.93 for the community sample; range for the U.S. sample was .73–.95). Especially in the community sample, the lower value was within a marginally acceptable range. However, Millon (1977) did not design this instrument for normal populations.

MCMI-III. Following publication of the MCMI-III (Millon, 1994) a new Dutch translation and validation project was started in Belgium and the Netherlands (Sloore & Derksen, 1997). Two independent teams of bilingual psychologists were formed to translate test items. In a second step, a discussion-based integration of the translations was made. An experienced linguist then conducted an independent back-translation of the combined form without knowledge of the U.S. original. A final version was approved by the project leaders that resolved any discrepancies. In the next step, a group of 30 bilingual adults completed the MCMI-III twice. Half of the participants took the Dutch test first and 2 weeks later completed the English version, whereas the other half completed the English test first and the Dutch version 2 weeks later. This methodology is able to identify potential problems in the psychological meaning of test items across translations. Items that were identified as problematic by these data were rewritten and tested using the same procedures (Sloore & Derksen, 1997).

A review of the Dutch MCMI-III can be found in Rossi et al. (2008). Rossi and colleagues (Rossi, Van den Brande, Tobac, Sloore, & Hauben, 2003) demonstrated that internal consistency estimates for the Dutch scales were similar to those of the U.S. MCMI-III (Millon, 1994). Construct equivalence of the Dutch and U.S. MCMI-III versions was clearly demonstrated in a heterogeneous sample of patients (68%) and convicts ($N = 1,210$, 39% women; Rossi, van der Ark, & Sloore, 2007). Factor analysis with parallel analysis identified

four factors in the total sample: general maladjustment, aggression/social deviance, paranoid/delusional thinking, and emotional instability/detachment. Factor invariance was corroborated for men and women across clinical and forensic settings, factor analytic method (principal axis factoring or principal components), and use of linearly dependent (overlapping items) versus independent scales (only prototypal items), with Procrustes-rotated congruency coefficients that were all above .90. Although studies of the U.S. MCMI-III (Craig & Bivens, 1998; Haddy et al., 2005) identified three rather than four factors, this appears to be due solely to methodological differences, especially in the way the number of factors was decided on (i.e., the Dutch study applied parallel analysis using raw data permutations, so that the original distribution of the raw scale scores is preserved). Furthermore, cross-cultural invariance of the Dutch and U.S. factors was confirmed with congruency coefficients above .90 when the same methodological decisions (number of factors, extraction, and rotation method) were taken.

The first two studies on convergent validity were published in 2003 (Rossi, Hauben, Van den Brande, & Sloore, 2003; Rossi, Van den Brande, et al., 2003). Both used the same sample of 870 psychiatric patients and 477 prison inmates. Most MCMI-III scales had their highest positive correlation with corresponding clinical ratings. Absolute values were in the low to moderate range (all $\leq .35$), but this was expected because correlations between self-reports and clinical reports are attenuated by methodological variance. MCMI-III PD and CS scales also had their highest positive correlation with corresponding Minnesota Multiphasic Personality Inventory-2 (MMPI-2; Butcher et al., 2001) scales (i.e., those developed by Morey, Blashfield, Webb, & Jewell [1988] and Somwaru & Ben-Porath [1995]), with the exception of Compulsive, a finding consistent with similar studies in U.S. populations (e.g., Hicklin & Widiger, 2000). Another problem shared by the Dutch and U.S. versions of the MCMI-III is high scale intercorrelations (all $> .60$), which tend to reduce their discriminative power.

In a sample of Dutch ($N = 263$, 207 male, 56 female) and U.S. ($N = 306$ males; Ward, 1995) substance abusers (SAs), interrelations between the U.S. MCMI-II, Dutch MCMI-III, and Dutch MMPI-2 were not as robust (Egger, De Mey, Derksen, & Van der Staak, 2003). This is probably due to use of U.S. MCMI-II test data for comparison with the Dutch MCMI-III. For example, the four principal components extracted from Dutch MCMI-III data (labeled neuroticism, emotional maladjustment, psychotically detached, and antisocial traits) did not correspond with those extracted from the U.S. MCMI-II (congruency coefficients were $< .85$; Egger et al., 2003). Notwithstanding, a more recent structural validity study ($N = 968$) on the MMPI-2-RF and MCMI-III (Van der Heijden, Egger, Rossi, & Derksen, 2012) resulted in a higher order structure with four dimensions—internalizing, externalizing, paranoid ideation/thought disturbance, and pathological introversion—that corresponds to results from earlier U.S. research on pathological personality dimensions (e.g., Sellbom, Ben-Porath, & Bagby, 2008), as well as research linking pathological personality traits to mental disorders (e.g., Markon, 2010). The findings supported Millon's theoretical spectrum model of personality as the foundational from which CSs emerge (Millon & Davis, 1996).

MCMI–III scales and those of the Structured Clinical Interview for the Five Factor Model (SIFFM; Trull & Widiger, 1997) were used as predictors of the PD scores obtained with the Structured Clinical Interview for DSM–IV Personality Disorders–II (SCID–II; First, Gibbon, Spitzer, Williams, & Benjamin, 1997) in a sample of 50 psychiatric inpatients (40 men and 10 women; Rossi & De Weerd, 2013). A general personality pathology factor (GPF) was entered in the first step of hierarchical regression analyses by summing the symptom counts of the nontargeted PDs. In a second step, MCMI–III scales were entered, and in a third step the SIFFM scales were entered. A separate set of analyses reversed the order of entry of the MCMI–III and SIFFM data. Results indicated that SCID–II dependent, avoidant, depressive, antisocial, narcissistic, paranoid, and histrionic PD scores could be better predicted by scales derived from an integrative clinical model like Millon's (Millon & Davis, 1996) compared with those derived from a factorial model of normal personality (e.g., the Five-factor model [FFM]). Conversely, SCID–II Schizoid, Borderline, and Obsessive–Compulsive PD scale scores were better estimated by FFM measures than those of the MCMI–III, indicating that these disorders might be better conceptualized as extreme variants of normal traits rather than pathological traits.

Concerning the development of BR scores, a provocative approach was taken by Rossi and Sloore (2005) in their study of 524 patients (255 male, 269 female). The U.S. technique of constructing BR scores on the basis of prevalence rates was compared with BR scores created on the basis of receiver operating characteristics (ROC). Diagnostic efficiency statistics from the Dutch sample were in general weaker than those found in Millon's (1997) study, but higher than those found in his earlier report (Millon, 1994). This is not surprising, as Hsu (2002) pointed out that methodological flaws in the 1994 study likely resulted in an underestimation of diagnostic hit rates for the MCMI–III scales, whereas flaws in the 1997 study led to an overestimation of hit rates. In any case, BR scores using ROC analyses performed better than the classical BR scores on trait and disorder level or symptom level, with good (and higher) sensitivity for all scales. The somewhat lower specificity values of the Dutch version constrain its diagnostic use, but it remains an excellent screening device given the high sensitivity values.

Detailed diagnostic efficiency statistics for the Dutch MCMI–III were reported in Rossi and Sloore (2008). MCMI–III-generated Axis I and II diagnoses (using BR 75 and BR 85 as cutoff scores) were compared to clinician-determined diagnoses in a mixed clinical and forensic sample ($N = 290$ females, 337 males). Classical diagnostic validity measures (sensitivity, specificity, positive predictive power [PPP], negative predictive power [NPP], and the overall correct classification) pointed out that the Dutch MCMI–III is a useful screening instrument. Additionally, calculation of incremental PPP and NPP (positive values indicate that positive or negative test-based findings are more informative for diagnostic decisions than the prevalence rate of a disorder), chance-adjusted efficiency measures (that provide information about the relative abilities of a test to discriminate between disordered and nondisordered persons; e.g., Cohen's kappa and Phi), and other cut-score-independent measures (e.g., concordance index) consistently showed that all scales performed

better than chance, and discriminated in the right direction. The main strength of the Dutch version was the avoidance of false negatives, and performance was consistently better than random guessing.

Conclusion. Two Dutch translations of the MCMI–I were modestly successful, but to our knowledge no translation was made of the MCMI–II. By contrast the Dutch MCMI–III has generally demonstrated good construct validity. Structural invariance with the U.S. version has been demonstrated, as well as convergent and predictive validity. The use of ROC BR scores is a unique feature, and the available diagnostic validity studies found that the Dutch version is an excellent screening device. For categorical diagnoses, further testing is needed.

Spanish Translation

MCMI–II. We were unable to find a Spanish-language version of the MCMI–I that was created for use outside the United States. A Spanish MCMI–II (Ávila-Espada, 1998) was created following international guidelines (ITC, 2005) and received good support in terms of convergent validity. Spanish PD and CS scales showed expected patterns of correlations with Big Five factor scores (Pedrero-Pérez, 2003), measures of self-efficacy (Chicharro Romero, Pedrero-Pérez, & Pérez López, 2007), a brief screening instrument for attention deficit/hyperactivity disorders (Pedrero-Pérez & Puerta García, 2007), factors measuring Cloninger's (1987) model of personality (Pedrero-Pérez & Eduardo, 2006), and a Spanish inventory assessing personality pathology (Caballo, Guillen, & Salazar, 2009; Caballo, Guillen, Salazar, & Irurtia, 2011; Caballo & Valenzuela, 2001). Additionally, a circular arrangement of the MCMI–II PD scales (created by plotting the factor loadings of the scales on the first two orthogonally rotated principal components) revealed ordering that was in line with Millon's (1987) model (Felipe & Ávila, 2008).

Although three revised Spanish MCMI–II manuals were published (Millon, 1998, 1999a, 2002), the test's BR scores were never recommended for making patient diagnoses (see also Sanz, 2007). Careful examination of the manuals shows different BR score transformations across all of them, with no satisfactory explanation as to why. Furthermore, no data are presented verifying diagnostic hit rates for scales at the standard cutoffs of BR 75 and BR 85.

By contrast, several studies have been published showing poor diagnostic validity of the Spanish MCMI–II. Winberg Nodal, and Vilalta (2009) found that 70% of the participants ($N = 86$) in their sample of plaintiffs ($n = 33$) and defendants ($n = 53$) had elevations $BR > 85$ on the Compulsive scale, regardless of whether the respondent came from a civil or criminal setting. Errasti Pérez et al. (2006) found the MCMI–II Drug Abuse scale to have weak sensitivity, with 60.7% of 91 drug addicts not detected using a standard scale cutoff. Using a large sample of 1,106 drug addicts (884 men) seeking treatment, Pedrero-Pérez, López-Durán, and Fernandez del Rio (2012) found five scale-level factors that did not appear to measure stable personality traits. The largest factor measured recent-onset Axis I disorders, the second factor represented suicidal ideation, the third measured issues associated with drug abuse, the fourth measured normal personality traits, and

the fifth represented dysfunctional traits. The authors concluded that this could lead to biased prevalence rates and biased comorbidity rates of PDs and addictive behaviors. Another factor analytic study in 749 SAs undergoing treatment suggested that most of the variance in MCMI-II PD and CS scales could be accounted for by unstable symptoms rather than stable traits (Pedrero-Pérez, 2009).

MCMI-III. The Spanish MCMI-III (Cardenal & Sánchez-López, 2007; Cardenal, Sánchez-López, & Ortiz-Tallo, 2007) was translated according to international guidelines (ITC, 2005). Test-retest reliability of the scales ranged from .82 to .96, and alpha coefficients ranged from .65 (Compulsive scale) to .88 (Major Depression scale). The latter values are quite similar to those of the U.S. version (.66-.90). BR scores were developed in a large clinical sample comprising 964 participants (478 male) with valid MCMI-III profiles (105 clinicians from different settings collected data between 2002 and 2005).

Similarity to data from U.S. samples in terms of the factor structure for the scales was demonstrated in a sample from Argentina ($N = 224$ clinical patients and 562 controls), as well as scale reliability and construct validity (Casullo, Castro Solano, Braude, & Koldovsky, 2000). Factor structure of the scales was corroborated in a sample of 236 patients with PDs in an ex post facto, prospective design (Besteiro, Lemos, Muñoz, García, & Álvarez, 2007).

Aluja and colleagues conducted four studies of the test's convergent validity (Aluja, Cuevas, García, & García, 2007a, 2007b; Aluja, García, Cuevas, & García, 2007; Aluja, Blanch, García, García, & Escorial, 2012). In Spanish community samples (mainly undergraduates; $N = 529-673$), they (a) showed predicted relationships between MCMI-III PD scales and dimensions and facets of the Zuckerman-Kuhlman-Aluja Personality Questionnaire (Aluja, Kuhlman, & Zuckerman, 2010); (b) demonstrated that the Zuckerman personality model and FFM explain the same amount of variance (30% each) in MCMI-III PD scales; and (c) confirmed the cross-cultural stability of correlations between the MCMI-III PD scales and NEO Personality Inventory-Revised facet scales. A major limitation of these studies was the use of nonclinical populations.

Thus far, there have been no published studies of the diagnostic validity of the Spanish MCMI-III. However, the prevalence of clinically significant MCMI-III PD and CS scale scores (i.e., BR > 75) was evaluated in a large sample of psychiatric patients from Spain ($N = 7,011$; 48.8% male; Ortiz-Tallo, Cancino, & Cobos, 2011; Ortiz-Tallo, Cardenal, Ferragut, & Cerezo, 2011). The Histrionic, Narcissistic, and Compulsive PD scales had a higher prevalence rate than expected (based on estimates from the U.S. MCMI-III). However, it should be noted that a majority of the study participants were under treatment for nonpsychiatric problems such as relational and occupational conflicts. Research with the U.S. MCMI-III has consistently shown that higher scores on these scales are inversely related to level of psychopathology (e.g., Craig, 1999). Nevertheless, the high prevalence of anxiety symptoms found in the sample was within expectations, as nearly all groups of help-seeking persons are characterized by mild anxiety (Endler & Kocovski, 2001). Gender differences were in line with several other studies (Cerezo, Ortiz-Tallo, &

Cardenal, 2009; Loinaz, Echeburúa, Torrubia, Navarro, & Fernandez, 2009; Loinaz, Ortiz-Tallo, Sánchez, & Ferragut, 2011; Saiz, Rodríguez, García, Prieto, & Saiz-Ruiz, 2009) and Millon's model: Women scored higher on the Avoidant, Depressive, Dependent, Sadistic, Negativistic, Borderline, Anxiety Disorder, Dysthymic Disorder, Somatoform Disorder, and PTSD scales, whereas men scored higher on the Schizoid, Narcissistic, Antisocial, Paranoid, Alcohol Dependence, Drug Dependence, and Thought Disorder scales. According to Millon and Davis (1996, 1998), disorders in women are indeed related to submission, withdrawal, and difficulties in enjoying life, whereas disorders in men are more associated with alcohol and SA.

Conclusion. Although the Spanish MCMI-II received empirical support for its convergent validity, diagnostic use of the test has been discouraged. The MCMI-III translation meets current international standards, and the factor structure has been confirmed. There is good support for its convergent and predictive validity, but not yet in clinical samples. Spanish BR score elevations and gender differences were in line with expectations, but there is no independent study of their diagnostic validity at this time.

Other Translations

Our survey of the international research literature revealed adaptations of the U.S. MCMI-I and MCMI-III for clinical use in Brazil, China, Iran, Italy, Norway, and Romania. However, only a handful of published studies are available concerning the construct validity of these translations. For the Romanian MCMI-III we did not find publications other than the manual (Millon et al., 2010).

MCMI-I. PD scales of a Norwegian-language MCMI-I showed good correspondence with interview-based DSM diagnoses of PDs in a sample of 272 psychiatric outpatients (Torgersen & Alnæs, 1990). All MCMI-I PD scales except Compulsive and Passive-Aggressive were significantly correlated with their matching interview-based scale. The largest positive correlations were found for the Avoidant (.42) and Dependent (.38) scales, with those of the Histrionic, Narcissistic, Schizotypal, Borderline, and Paranoid scales ranging from .20 to .37.

MCMI-III. A Chinese (Mandarin) version of the MCMI-III has been developed (Li, Yang, & Jiang, 2010), and the initial study reported good internal consistency estimates for the scales (mean coefficient alpha = .72; mean split-half correlation = .71), and excellent test-retest reliability (mean for all scales = .70; however, the time interval between test administrations was not specified). No independent studies have yet been published.

A preliminary translation for Brazil (Portuguese) was made by Paiva da Rocha and colleagues (Carvalho de Sousa, Paiva de Rocha, & Alchieri, 2011; Paiva da Rocha, Carvalho de Sousa, Alchieri, de Araújo Sales, & Nascimento de Alencar, 2011) and pilot-tested with 15 subjects. Magalhaes, Magalhaes, Noblitt, and Lewis (2012) worked on a separate Brazilian version of the MCMI-III and applied a more thorough translation process combining different techniques. Still, alpha coefficients for the scales were problematic, perhaps because

their sample was limited to college students ($N = 239$, 189 women). No diagnostic information was made available and BR scores were not derived.

A Persian version of the MCMI-III was developed by Sharifi and Karami (2007) and applied in combination with clinical interviews to diagnose borderline PDs in 50 women referred to mental health centers in Iran (Nasiri, Abedi, Ebrahimi, Armeli, & Samouei, 2013). However, no information on construct validity was made available.

Finally, Zennaro et al. (2013) compared the diagnostic validity statistics of the Italian MCMI-III (Zennaro, Ferracuti, Lang, & Sanavio, 2008) with the U.S. MCMI-III (Millon, 1994, 1997; see Hsu, 2002). With the exception of the Histrionic and Compulsive scales (with lower values), alpha coefficients obtained in the Italian sample of 789 psychiatric outpatients (400 men) were comparable to those of the U.S. scales. Diagnostic validity statistics (e.g., sensitivity, specificity, and PPP of each scale) were, in general, problematic in that many individuals with psychopathology were not identified by the Italian MCMI-III scales. It was mainly the cutoff level of the BR scores that reduced the diagnostic validity, as Cohen's d values indicated that the scales were able to differentiate between pathological and nonpathological individuals. The researchers therefore concluded that using another parametric standard might improve diagnostic accuracy of the scales.

CLINICAL APPLICATIONS

Our literature search revealed more than 200 international application studies of the MCMI in normal, medical, psychiatric, and prison populations. Because of space limitations, we had to limit our review to research focusing on the diagnosis and treatment of neuropsychiatric disorders in mental health settings. Previously, Millon (2009; Millon & Bloom, 2008) reported on a wide variety of empirical investigations with the U.S. MCMI for diagnostic and treatment purposes over a 25-year period. He found clinical applications primarily in the areas of neuropsychology, SA, PTSD, treatment planning, psychotherapy, marital counseling, and clinical integration with other assessment measures (e.g., Rorschach Inkblot Method). As for international studies, we found published reports covering the first four areas noted by Millon, as well as studies addressing mood disorders, somatoform disorders, eating disorders (EDs), and patient coping behavior. Results of these investigations are summarized next by topic area. Because the vast majority targeted specific psychiatric disorders, we present findings from these studies first, according to the order in which the diagnoses are listed in *DSM-5*.

Neuropsychological Disorders

Pedrero-Pérez et al. (2013) explored the relationship between PD traits and problems in prefrontal cortex functioning among a diverse sample of 371 Spanish drug abusers. In a series of regression analyses, the investigators found that over 20% of the variance in 8 of 13 MCMI-II PD scales could be accounted for by the patient's aggregate number of brain-related problems (assessed with the Inventory of Prefrontal Symptoms). By contrast, studies with the U.S. MCMI-II found no relationship between neuropsychological indexes of

brain damage and any of the test scales. By now there are a handful of published studies with the U.S. MCMI-III; however, the findings are not robust enough to warrant conclusions (Russel & Russel, 2008).

Mood Disorders

The relationship between clinician-diagnosed mood disorders and MCMI-I scale scores was examined in a consecutive sample of 298 Norwegian psychiatric outpatients (Alnæs & Torgersen, 1989, 1990), among which were 55 individuals with major depressive disorder (MDD), 84 patients with anxiety disorders (AD; e.g., generalized anxiety disorder, agoraphobia, and panic disorder), 36 patients with comorbid MDD and AD, and 97 patients diagnosed with a variety of Axis I disorders other (OTH) than MDD and AD (e.g., somatoform and adjustment disorders). In comparison to the OTH group, patients with MDD scored significantly higher on the MCMI-I Compulsive scale, AD patients with panic symptoms scored higher on the Avoidant scale, and the MDD+AD group scored higher on the Anxiety Disorder scale. This latter group also had more lifetime diagnoses of borderline and passive-aggressive PD. MDD+AD patients without panic symptoms scored significantly higher than others on the MCMI-I severe personality pathology scales. Alnæs and Torgersen (1997) conducted a follow-up study with 253 of these participants to assess factors related to relapse. They found that patients with borderline PD and high levels of dependency were most likely to have recurrences of MDD. By contrast, Birket-Smith, Hasle, and Jensen (2007) were unable to find MCMI-I PD or CS scales that could reliably differentiate 40 Danish patients diagnosed by structured interview (*DSM-III-R* criteria) with panic disorder, agoraphobia, generalized anxiety disorder, and anxiety disorder not otherwise specified.

The relationship between mood disorders and MCMI-III PD scales was examined by Ostacoli et al. (2013) in a sample of 209 Italian inpatients diagnosed with MDD or manic/hypomanic disorders by the SCID. Recursive partitioning analysis found that onset of a mood disorder before age 29 was the variable most strongly linked to the number of clinically elevated ($BR > 75$) PD scales obtained by participants. A Spanish study of 37 outpatients with clinician-diagnosed depressive disorders found a significant relationship between MCMI-II PD scale elevations and chronicity of mood disorder symptoms (Prieto Cuéllar, Vera Guerrero, Pérez Marfil, & Ramírez Uclés, 2007).

Lai, Pirarba, Pinna, and Carpinello (2011) investigated whether the MCMI-III could reliably differentiate Italian patients diagnosed by the SCID with bipolar disorder only ($n = 28$), bipolar disorder and borderline PD ($n = 18$), or bipolar disorder and other PD ($n = 11$). They found that bipolar and borderline PD patients scored significantly higher than patients in the other two groups on the Depressive, Narcissistic, Antisocial, Sadistic, Negativistic, Anxiety Disorder, Bipolar:Manic, Alcohol Dependence, Drug Dependence, and Thought Disorder scales, whereas the bipolar and other PD patients scored highest among all groups on the Avoidant, Dependent, Masochistic, and Dysthymic Disorder scales.

Osma, García-Palacios, Botella, and Barrada (2014) compared the MCMI-III profiles of 152 Spanish patients, 52 of whom met structured interview criteria for panic disorder with

agoraphobia (PDA), 45 who were determined to be high in anxiety sensitivity (AS) based on self-report, and 55 who had no clinical disorder or high anxiety sensitivity (ND). PDA and ND individuals showed expected differences on all MCMI–III scales. However, the PDA and AS individuals had very similar MCMI–III profiles, differing only on self-report measures of phobic anxiety (AS > PDA) and paranoid ideation (PDA > AD). In spite of this, the investigators found significantly different MCMI–III profiles among AS participants grouped according to level and form of impulsivity.

In Italy, Tomassini et al. (2009) administered several self-report measures including the MCMI–III to 45 consecutively admitted psychiatric outpatients with a primary diagnosis of anxiety disorder. Among several potential correlates, the investigators found that only attentional (i.e., cognitive) impulsiveness showed strong positive relations with the MCMI–III Schizoid, Depressive, Schizotypal, and Borderline PD scales, and a negative association with the Compulsive scale. Attentional impulsiveness was also found to correlate significantly with MCMI–III CS scales measuring mood-related symptoms.

Posttraumatic Stress Disorders

Several MCMI studies have been conducted among survivors of the ethnic civil war that followed the breakup of Yugoslavia (1991–2001). Serbian patients with PTSD symptoms after experiencing severe war-related trauma ($N = 274$) scored higher than non-PTSD participants on the MCMI–I Avoidant, Dependent, Borderline, and Paranoid PD scales (Dimić, Lečić-Toševski, & Gavrilović-Janković, 2004). The development of PTSD is known to be influenced by personality traits as well as level of exposure to stressful events (Jakšić, Brajković, Ivezić, Topić, & Jakovljević, 2012). In this regard, Lečić-Toševski, Gavrilović, Knezević, and Priebe (2003) studied 107 medical students who had experienced air attacks during the civil war. They found that self-reported levels of intrusion symptoms could be predicted by severity of stress exposure and MCMI–I Compulsive and Passive-Aggressive PD scale scores, with higher symptoms associated with higher stress exposure, lower compulsive traits, and higher passive-aggressive traits. The researchers also found that symptoms of avoidance could be predicted by the students' level of stress exposure and their scores on the MCMI–I Avoidant PD scale (higher avoidance being linked to higher exposure and higher avoidant scores).

Palić and Elklit (2014) studied 116 Bosnian refugees receiving treatment at Danish rehabilitation centers. Individuals classified as having disorders of extreme stress not otherwise specified (DESNOS) had higher scores on the MCMI–III Schizotypal and Paranoid PD scales, as well as all Axis I CS scales including PTSD, than those not classified with DESNOS. The researchers concluded that complex PTSD (DESNOS) is best characterized by a mix of PD traits and CSs, which contradicts the *International Classification of Diseases*, 11th Revision, proposal of a disorder that is unrelated to personality traits.

Findings from these studies suggest that a more varied and complex set of MCMI profiles might be associated with PTSD than those found with the U.S. MCMI (Craig, 1999; Millon & Bloom, 2008). Most of the U.S. studies contrasted the test

data of military combat veterans diagnosed with PTSD against those obtained from psychiatric control subjects, and from these comparisons a fairly simple profile emerged involving elevations on the Avoidant and Passive-Aggressive PD scales, with subgroups having additional elevations on a few other scales, including Schizoid, Dependent, and Borderline. However, the European studies included mostly civilians who had endured more severe trauma than the U.S. PTSD subjects, which could account for the increased diversity of their profiles, but additional research is needed to confirm this.

Somatoform Disorders

Birket-Smith and Mortensen (2002) studied 127 Danish patients diagnosed with somatoform disorders (SDs) by the SCID. Patients presenting with pain (SPD) did not differ significantly from patients without pain on MCMI–II PD and CS scales. SD individuals obtained significantly higher scores than patients with conversion disorder (CD) on most MCMI–II scales, and the test profiles of SPD and CD patients were very similar.

Researchers in Italy found that women ($N = 47$) with temporomandibular joint pain syndrome had significantly higher mean scores on the MCMI–II Compulsive PD scale compared with the standardization group (Baggi, Rubino, Zanna, & Martignoni, 1995). In Spain, researchers found that poor adjustment to chronic pain was reliably associated with MCMI–II PD scale elevations in a sample of 91 adults with chronic pain conditions (A. M. Herrero, Ramírez-Maestre, & González, 2008). However, the MCMI–II PD profiles were not linked to differences in cognitive appraisal and perceived pain.

Eating Disorders

More than 20 international studies have been published on the MCMI profiles of patients diagnosed with anorexia, bulimia, morbid obesity, and other EDs, most of them with the Spanish MCMI–II. Earlier we noted problems with the test's diagnostic accuracy when using the BR cutoff scores. In this regard Marañón, Grijalvo, and Echeburúa (2007) compared MCMI–II PD diagnoses of 84 ED outpatients with those obtained from the International Personality Disorders Examination (IPDE). The MCMI–II suggested at least one PD (based on scale scores BR > 75) for 77.4% of the participants, whereas the IPDE identified a much lower number (54.8%), and the concordance between the measures was marginal. An earlier study (García-Palacios, Rivero, & Botella, 2004) reported that 18 of 22 ED patients (82%) had one or more clinically significant (BR > 75) MCMI–II PD scale elevations, and del Río Sánchez, Torres Pérez, and Borda Más (2002) found four or more MCMI–II PD scale elevations (BR > 75) in 12 of 33 bulimic patients (36%), although no unique personality pattern was found for the sample. It is noteworthy, however, that when Spanish investigators used a higher cutoff score (BR > 85) to estimate PD prevalence in a sample of 147 outpatients with EDs (anorexia, bulimia, binge eating), only 28% of the sample obtained MCMI–II PD scores at this level (Jáuregui Lobera, Santiago Fernández, & Estébanez Humanes, 2009).

Because the psychometric properties of the Spanish MCMI–II are adequate, research findings that do not depend on diagnoses made with BR cutoff scores should be reliable. Several

studies of this type have shown fairly high levels of psychopathology among ED patients (both PDs and CSs) compared to psychiatric and normal control groups, with the highest levels of disturbance usually found among bulimics. Spanish researchers (Martín Murcia, Cangas Díaz, Pozo Pérez, Martínez Sánchez, & López Pérez, 2008) found that 67 ED patients differed significantly from control subjects on most MCMI–II PD scales, but not Dependent, Histrionic, Narcissistic, and Compulsive. The highest elevations were found on the Avoidant and Passive-Aggressive scales. No differences were found on the PD scales when ED patients were grouped according to diagnostic subtype (bulimia, anorexia, and other ED). Women ($N = 91$) with bulimia nervosa (purging type; $n = 31$) had higher borderline PD scores than women with anorexia nervosa (31 restricting subtype and 31 binge eating and purging subtype), and those at high risk for EDs (Pérez, del Río Sánchez, & Mas, 2008). In a separate study of 98 outpatients, high MCMI–II Borderline scores were characteristic of bulimic patients, whereas high scores on the Dependent and Compulsive PD scales were most common among anorexic patients (Quiles Marcos, Terol Cantero, Pagan Acosta, & Escobar Romero, 2009). Torres Pérez, del Río Sánchez, and Borda Mas (2008) found elevated ($BR > 75$) MCMI–II Borderline scores in 23 of 31 (74%) patients diagnosed with bulimia nervosa (purging subtype), 19 of 31 (62%) individuals diagnosed with anorexia nervosa (binge-eating/purging subtype), and 13 of 31 (45%) subjects diagnosed with anorexia nervosa (restricting subtype), compared with less than 5% of the women in the psychiatric ($n = 31$) and normal control ($n = 31$) groups.

A structural model of the relationship between MCMI–II PD scale scores and EDs was validated by Borda-Más et al. (2011). They contrasted the test profiles of 93 women with EDs against those of 62 female control subjects. Good fit was reached for a model that linked ED diagnosis with high scores on the Schizoid, Self-Defeating, Borderline, and Paranoid PD scales. Self-esteem was found to be a mediating variable on the impact of PD traits on EDs, and perfectionism was found to mediate the impact of borderline traits on EDs and self-esteem. A subsequent study using only PD patients ($N = 100$) identified distinct MCMI–II profiles for patients with high versus low self-esteem. High levels of self-esteem were associated with elevations on the MCMI–II Histrionic and Narcissistic scales, whereas low self-esteem was associated with elevations on the Schizoid, Compulsive, Passive-Aggressive, Self-Defeating, Borderline, and Schizotypal scales (Martín & Manuel, 2012).

A handful of studies used the MCMI–II to identify characteristics of ED patients that are associated with positive versus negative treatment outcomes. Researchers in Portugal used a Portuguese-language version of the MCMI–II to evaluate the personality profiles of 212 patients (ages 16–65) undergoing examination for surgical treatment of morbid obesity (Travado, Pires, Martins, Ventura, & Cunha, 2004). When compared to a control group, obese patients showed significantly higher scores on 10 of 13 MCMI–II PD scales, had higher levels of anxiety and depression, and reported a lower quality of life. Unfortunately, no information was provided on how the Portuguese MCMI–II was translated, adapted, and validated, so caution is necessary when interpreting the results. Nevertheless, a subsequent study of 55 obese patients using the Spanish MCMI–II (López-Pantoja et al., 2012) found

significantly higher scores for this group on the Narcissistic, Compulsive, Paranoid, Anxiety, Somatoform, Alcohol Dependence, Major Depression, and Thought Disorder scales, compared to those of 66 normal-weight controls. Guisado Macias and Vaz Leal (2003) studied 140 morbidly obese patients 18 months after bariatric surgery (vertical banded gastroplasty), whom they divided into groups based on whether they showed evidence of binge eating ($n = 25$) or not ($n = 115$). Binge eaters had more disturbed eating behavior (more binge eating, less restriction, more disinhibition, more hunger) and higher scores on the MCMI–II Sadistic, Passive-Aggressive, Bipolar:Manic, Alcohol Dependence, and Major Depression scales than nonbinge eaters.

One hundred morbidly obese patients who had undergone surgical treatment (vertical banded gastroplasty) for weight reduction were divided into high (HWL $\geq 30\%$ of body mass) versus low (LWL $\leq 30\%$ of body mass) weight-loss groups 18 months after surgery (Guisado Macias et al. 2002). HWL patients scored significantly lower than LWL patients on the MCMI–II Avoidant, Passive-Aggressive, and Borderline scales. Overall, greater weight loss was associated with lower psychopathology, whereas posttreatment binge eating was associated with higher psychopathology. Finally, a follow-up study of 34 ED patients over 4.5 years revealed that bulimic individuals improved more than anorexic patients, and those most resistant to treatment had elevations on the MCMI–II Avoidant and Schizotypal scales (Martín Murcia, Cangas Díaz, Pozo Pérez, Martínez Sánchez, & López Pérez, 2009).

There are two published MCMI–III ED studies, both of which used cluster analysis to identify PD subtypes among the subjects (Gullo, Lo Coco, Salerno, La Pietra, & Bruno, 2013; Pérez Martínez, Tirado González, Mateu Vicente, van-der Hofstadt Román, & Rodríguez-Marín, 2013). The first of these included 50 patients preparing for bariatric surgery. Overall, individuals scored highest on the Histrionic and Compulsive PD scales. Cluster analysis revealed three distinct subgroups with significant differences on virtually all MCMI–III scales. The second study, conducted in Italy, cluster analyzed the MCMI–III results of 149 obese patients with similar body mass scores. Three clusters were found that the investigators labeled externalizing (41.6% of subjects), internalizing (32.0%), and high functioning (26.1%). Patients in the externalizing cluster were characterized by high scores on the Anti-social, Sadistic, and Negativistic scales. Internalizing patients had high scores on the Schizoid, Avoidant, Depressive, and Dependent scales. They also exhibited higher levels of distress, lower psychosocial functioning, more interpersonal problems, and more eating behavior symptoms than patients in the other clusters. The high functioning cluster included patients with high scores on the Histrionic, Compulsive, and Narcissistic scales. They scored lowest among all patients on measures of psychological distress, and highest on measures of self-esteem and quality of life.

Substance Abuse

We found more than two dozen published reports between 1992 and 2014 focusing on the MCMI profiles of alcohol and drug abusers in and out of treatment. A majority employed the MCMI–II, but there are now 12 studies with the MCMI–III. The only MCMI–I investigation in this group examined the

test profiles of alcoholics ($N = 90$) undergoing treatment for the first time at a Danish outpatient clinic (Simonsen, Haslund, Larsen, & Børup, 1992). High scores ($BR > 75$) on the Dependent (56.8%) and Passive-Aggressive (59.5%) scales were common in this sample, and elevations on the Passive-Aggressive scale were associated with early dropout from treatment. In terms of discriminant validity, only the Alcohol Abuse scale differentiated the participants from those in other diagnostic groups using the U.S. standardization norms, thus confirming that scale's utility.

Studies with the MCMI-II and MCMI-III have shown high levels of PD traits among patients diagnosed with alcohol abuse or dependence (e.g., Bravo de Medina, Echeburúa, & Aizpiri, 2007; Echeburúa, Bravo de Medina, & Aizpiri, 2005, 2007; Fernández-Montalvo, Landa, López-Goñi, & Lorea, 2006; Fernández-Montalvo, Landa, López-Goñi, Lorea, & Zarzuela, 2002; Picci et al., 2012; So, 2005; Vanem, Krog, & Hartmann, 2008). Most frequently cited were clinical elevations ($BR > 75$) on the Avoidant, Dependent, Antisocial, Compulsive, Negativistic, and Paranoid scales, but elevations on the Histrionic and Narcissistic scales were also common. Due to the varied inclusion and exclusion criteria used by investigators, prevalence rates for alcoholic subjects with one or more clinically significant ($BR > 75$) MCMI PD scale elevations have ranged from 22% (Fernández-Montalvo et al., 2006) to 63% (Fernández-Montalvo et al., 2002), with 40% to 50% being most common (e.g., Echeburúa et al., 2005, 2007).

Patients diagnosed with drug abuse or dependence were also found to have high levels of PD traits when measured by the MCMI-II and MCMI-III (e.g., D'Anna & Pérez, 2004; Fernández-Montalvo, Lorea, López-Goñi, & Landa, 2003; Ghafarinezhad, Rajabizadeh, & Shahriari, 2013; López & Becoña, 2006; Lorea, Fernández-Montalvo, López-Goñi, & Landa, 2008; So, 2005; Vanem et al., 2008). Concerning prevalence, one Norwegian study of 276 inpatient drug abusers noted that 75% of subjects had at least one clinically significant ($BR > 75$) MCMI-II PD scale elevation (Ravndal & Amundsen, 2010), although most international studies have reported prevalence rates in the 35% to 50% range (e.g., Fernández-Montalvo et al., 2003; López & Becoña, 2006; Lorea et al., 2008). The PD scales most frequently elevated ($BR > 75$) in this population are Avoidant, Histrionic, Narcissistic, Antisocial, Negativistic, Borderline, and Paranoid, although the Dependent and Compulsive scales are sometimes cited.

A few studies have investigated age of onset, duration, and severity of substance abuse, as well as variables linked to relapse following substance abuse treatment. Patients with early onset of alcohol or drug abuse (< 18 years) were more likely to have highly elevated ($BR > 85$) MCMI-II Antisocial, Passive-Aggressive, and Borderline scale scores, and lower Dependent and Compulsive scale scores, than patients with onset after age 18 (Bakken, Landheim, & Vaglum, 2004). Patients with a long history of alcohol (Simonsen et al., 1992) or drug abuse (J. Herrero, 2004) were found to have more frequent elevations ($BR > 75$) on MCMI PD scales than patients with a shorter abuse history. Severity of drug abuse was linked to higher elevations on the MCMI-II Schizoid, Avoidant, Antisocial, and Passive-Aggressive scales in a sample of Spanish heroin and cocaine addicts (Cangas Díaz & Olivencia Lorenzo, 1999), although a subsequent study of patients

undergoing treatment for cocaine dependence did not find MCMI profile differences for subjects grouped according to severity of abuse (López Durán & Becoña Iglesias, 2008). Cocaine-dependent patients with high levels of antisocial PD traits showed greater consumption of cocaine after 2 years of treatment than patients with fewer antisocial traits (López Durán et al., 2008; López Durán et al., 2009).

Risk factors associated with SA including comorbidity have been addressed by international researchers. Alcohol or drug abuse patients with a history of violence (Fernández-Montalvo, López-Goñi, & Arteaga, 2012), criminal behavior (Fernández-Montalvo, López-Goñi, Arteaga, & Cacho, 2013), or psychological, physiological, or sexual abuse (Fernández-Montalvo, López-Goñi, & Arteaga, 2014), obtained higher MCMI-II PD and CS scores overall than patients without such features. Both alcohol and drug abuse patients with elevated ($BR > 75$) MCMI-III PD scale scores were more likely to have a history of self-harm than alcohol and drug abusers with lower PD scale scores, and nonabusers (Verrocchio, Conti, & Fulcheri, 2010). In this sample, drug abuse patients and those with elevated borderline scores were the most likely to have a history of self-harm among all study subjects. Bakken and Vaglum (2007) compared the MCMI-II profiles of Norwegian alcohol-dependent ($n = 156$) and polysubstance-dependent (PSD; $n = 131$) inpatients with ($n = 160$) or without ($n = 127$) a history of suicide attempts who were tested at intake and 6 years later. After controlling for age, gender, and substance use, the investigators found that patients with a history of suicide attempts had significantly higher scores on the Passive-Aggressive, Schizotypal, Borderline, and Paranoid scales than patients without this history (also see Landheim, Bakken, & Vaglum, 2006; Ravndal & Vaglum, 1999). Also in Norway, Axis II disorders were diagnosed using the MCMI-II in 146 alcohol-dependent and 114 PSD patients with and without social anxiety disorder (SAD; Bakken, Landheim, & Vaglum, 2005). Individuals with SAD exhibited more Axis II disorders (BR scale scores > 75) than those without SAD. Controlling for these disorders, SAD was a significant predictor of alcohol and PSD. Pedrero-Pérez and López-Durán (2005) found that 344 Spanish drug abuse patients with comorbid dysthymic disorders could be reliably differentiated from drug abusers with comorbid MDDs on most MCMI-II PD and CS scales. Finally, depressed Chinese SAs ($N = 107$) scored higher on most MCMI-III PD and CS scales than nondepressed subjects (So, 2005).

Picci et al. (2012) examined gender differences in the MCMI-III profiles of 206 Italian patients receiving alcohol treatment. Women ($n = 56$) had higher elevations than men ($n = 150$) on the Avoidant (21.4% vs. 9.3%), Self-Defeating (50.0% vs. 24.0%), and Borderline (42.9% vs. 25.3%) scales, a finding that compares favorably with studies in similar populations using *DSM* diagnoses (e.g., Powell & Peveler, 1996). In an earlier study, Landheim, Bakken, and Vaglum (2003) explored gender differences on the MCMI-II and other symptom measures in 260 Norwegian polysubstance abusers (PSAs) and pure alcoholics. The MCMI-II was used to assess the prevalence of PDs. They found that male PSAs had lower prevalence rates of Cluster C disorders but higher rates of antisocial PD than female PSAs. Female PSAs scored significantly higher than all other SAs on measures of borderline PD, PTSD, major depression, and simple phobias. Alcoholic

women were differentiated from alcoholic men by higher scores on measures of Cluster C and MDDs, whereas men showed higher scores than women on Cluster A measures and lower scores on measures of Axis I symptoms. In a diverse sample of 978 Spanish PSAs, J. Herrero (2004) found similar MCMI-II profile configurations for men ($n = 820$) and women ($n = 151$), both showing clinically significant ($BR > 75$) elevations on the Avoidant, Antisocial, Sadistic, and Passive-Aggressive PD scales. However, women could be distinguished from men by their additional elevations on the Histrionic and Borderline scales, whereas men had more frequent elevations than women on the Narcissistic scale.

Personality Disorders

Comparatively few studies have been conducted where the subject's MCMI PD diagnosis was of primary interest. We found reports evaluating the individual differences of patients diagnosed by the MCMI with dependent, histrionic, compulsive, and borderline PDs, and one that used the MCMI to estimate prevalence of PDs among psychotic patients. Concerning the latter, Simonsen et al. (2008) studied 55 psychiatric patients enrolled in a Scandinavian epidemiological research project who were in the early course of treatment for first-episode psychosis. The researchers used the MCMI-II to assess for the presence of PDs and their likely impact on pre-morbid adjustment. Thirty-three of the patients were assessed at 2-year follow-up for comorbid PDs with the MCMI-II and SCID-II. Results showed that half of the patients met criteria for two or more PDs, and one third did not fulfill the criteria for any PD. The MCMI-II and SCID-II indicated a high prevalence of schizoid (28% vs. 38%) and avoidant (38% vs. 34%) PDs, both of which were associated with social withdrawal during childhood and adolescence. The MCMI-II additionally indicated significant schizotypal traits in the sample, whereas the SCID-II suggested paranoid traits. This might be due to the fact that mistrust is often denied by patients on self-report measures but noticed by clinicians during interview assessment. By contrast, interviewers sometimes misinterpret schizotypal symptoms as prodromal characteristics rather than traits. In Columbia, Álvarez Ramírez (2013) compared the irrational beliefs of 24 patients diagnosed ($BR > 85$) with dependent PD by the MCMI-III and SCID-II with those of a control group ($n = 24$) having very low scores ($BR < 30$) on the MCMI-III Dependent PD scale. Individuals with dependent PD showed a prototypical repertoire of irrational beliefs, values, and concepts as defined by Ellis (1993) that was not found in the control subjects.

Patients diagnosed with histrionic PD ($n = 41$) by the MCMI-II were compared with 41 nonhistrionic PD individuals on type of repression used, as assessed by the Defense Mechanism Test (Rubino, Saya, & Pezzarossa, 1992). Significantly more histrionic PD patients were coded for the type of repression in which a threatening figure is transformed into a harmless object, whereas animal and statue repressions, when combined, were significantly more characteristic of the non-histrionic PD subjects.

The MCMI-II was applied to diagnose compulsive PD in 44 Italian outpatients with comorbid obsessive-compulsive disorder (OCD) to corroborate the high comorbidity between these disorders (Bogetto, Barzegà, Bellino, Maina, & Ravizza,

1997). An earlier study (Maina, Bellino, Bogetto, & Ravizza, 1993) already confirmed that, when using the MCMI-II, PDs are highly prevalent in OCD (91.7%), with avoidant PD being most common (68.7%). In chronic OCD there is a strong relationship with schizotypal PD, which is related to a negative treatment outcome.

Divac-Jovanović and colleagues (Divac-Jovanović & Lečić-Toševski, 1994; Divac-Jovanović, Svrakic, & Lečić-Toševski, 1993) compared the MCMI-I profiles of 121 psychiatric patients diagnosed with PDs by the SCID and those obtained from 67 control patients without SCID-diagnosed PDs. Both groups manifested similar MCMI-I profiles with one exception: SCID PD subjects had clinically significant ($BR > 75$) MCMI-I Borderline scale scores and the control subjects did not. SCID PD subjects also scored significantly higher on the Diagnostic Interview for Borderlines (Gunderson, Kolb, & Austin, 1981) than the controls.

Coping Behavior

Vollrath and colleagues (Vollrath, Alnæs, & Torgersen, 1994a, 1994b, 1998, 2003; Vollrath, Torgersen, & Alnæs, 1998) examined the coping behavior of psychiatric outpatients diagnosed by the MCMI-II with a variety of PDs and CSs. In general, PD subjects were found to disengage from goals, vent emotions, and make less frequent use of active coping strategies and social support than those without PDs. More frequent use of problem-focused coping and social support was correlated with lower PD scale scores, whereas dysfunctional coping was correlated with higher PD scores. When clinical symptoms were present, PD patients chose more maladaptive emotion-focused (e.g., disengagement) coping behaviors and fewer problem-focused coping behaviors than non-PD patients. In cases of the Somatoform, Dysthymia, Alcohol Dependence, and Thought Disorder scales, high neuroticism was found to be an important mediator toward a lack of problem-focused coping, and directing toward disengagement and discharging of emotions.

Treatment Predictors and Effects

Substance abuse. The high prevalence of PD traits in SAs certainly complicates treatment, as noted by findings with the U.S. MCMI that dual-diagnosis SAs have higher relapse rates than those without a secondary diagnosis (Millon & Bloom, 2008). PDs are indeed an important indicator of poor treatment outcome, as shown by Ravndal and Lauritzen (2004) in their study of treatment retention factors in a sample of 482 drug abusers admitted to Norwegian facilities between 1998 and 2000. Negative predictors for completion of inpatient treatment were presence of PD, three or more previous inpatient stays, and 11 or more years with use of syringes. A study of 102 Spanish cocaine-addicted patients showed that 100% of subjects diagnosed with histrionic PD (by the MCMI-II) dropped out of treatment (Fernández-Montalvo & López-Goñi, 2010). Dropouts also had higher scores on the MCMI-II Antisocial PD scale than subjects who completed treatment. In an earlier study of 42 Spanish SA patients in a therapeutic community, Fernández-Montalvo et al. (2004) found that 72% of those with two or more PDs (as diagnosed by the MCMI-II) abandoned treatment as compared to 33% of the patients with zero or one PD diagnosis.

Concerning other PD-related treatment factors, a Spanish study of 29 patients undergoing treatment for drug abuse showed that subjects with one or more MCMI-II PD diagnoses were more likely to be noncompliant (50% vs. 8%), and more likely to use alcohol or hashish during treatment (69% vs. 40%), than patients without a PD diagnosis (Cangas Díaz & Olivencia Lorenzo, 2001). By contrast, SAs with high levels of MCMI-II dependent PD traits were more likely to be abstinent 1 year after treatment than SAs with few dependent traits (López Durán et al., 2007). Among 107 cocaine-dependent patients, high scores on the MCMI-II Schizoid and Avoidant PD scales were associated with abstinence prior to inpatient admission and a favorable response to SA treatment (Pérez de los Cobos et al., 2010).

Preadmission characteristics can clearly predict treatment outcome. The presence of PDs measured within 2 weeks of intake by the MCMI-II was inversely related to completion of inpatient SA treatment program by 307 Norwegians (Ravndal, Vaglum, & Lauritzen, 2005). Earlier, Ravndal and Vaglum (1991b) showed that completion of a 1-year inpatient SA program was associated with low MCMI-I schizotypal PD scores. This finding was validated among 122 Spanish substance-dependent patients attending outpatient treatment programs (López-Goñi, Fernández-Montalvo, & Arteaga, 2012). Patients with high MCMI-II schizotypal PD scores were more likely to drop out of treatment than patients with low schizotypal scores. The MCMI-I Dysthymia scale has also been useful for predicting treatment outcomes. In a sample of 144 SAs, high dysthymia scores after 1 year increased the risk of drop-out from treatment five times in comparison to those with low dysthymia scores (Ravndal & Vaglum, 1994). In a Spanish study of SA patients readmitted following relapse, returning patients ($n = 165$) were found to have higher scores on the MCMI-II Avoidant, Antisocial, Self-Defeating, and Schizotypal PD scales than patients ($n = 87$) who had not relapsed (López-Goñi, Fernández-Montalvo, Cacho, & Arteaga, 2014).

All three versions of the MCMI have been used for pretreatment versus posttreatment comparisons. The stability of personality traits and CSs was investigated in a sample of drug abuse patients who were administered the MCMI-III every 3 months over a span of 6 years (De Groot, Franken, van der Meer, & Hendriks, 2003). Findings were based on the results of 72 subjects who provided at least four valid test profiles. Reliability coefficients were the highest for the Narcissistic and Antisocial scales, and significant changes were observed over time for the Schizoid, Avoidant, Negativistic, Schizotypal, and Borderline scales. A Spanish study among 200 cocaine-dependent patients compared MCMI-III test data taken at baseline and after 3 months of treatment (Vergara-Moragues, González-Saiz, Lozano, & Verdejo García, 2013). The investigators found lower mean scores for patients on most MCMI-III scales at retest, but not on the Narcissistic, Antisocial, Alcohol Dependence, and Drug Dependence scales. Ravndal and Vaglum (1991a) compared the MCMI-I data of 36 SA patients in a therapeutic community gathered at intake and 1 year later. Significant differences were found on the Antisocial PD scale, with higher scores associated with treatment dropout. The effect of SA treatment on the MCMI-II PD scores of 41 alcohol-dependent patients ($n = 41$) was examined by Hesse, Nielsen, and Røjskjær (2007), who collected test data at intake, discharge, and 6 months

posttreatment. Compared with data from a psychiatric control group ($n = 67$), the alcohol patients had significantly lower scores on the Schizoid, Avoidant, Dependent, Negativistic, Self-Defeating, and Borderline scales at discharge and follow-up than at intake.

An initial investigation of the effectiveness of personality-guided treatment for alcohol dependence (PETAD) versus cognitive therapy for alcohol dependence (CTAD) was conducted by Nielsen, Røjskjær, and Hesse (2007) among 108 alcoholics in Denmark. Subjects were randomly assigned to receive PETAD or CTAD, both of which are manualized treatments, although PETAD integrates cognitive therapy for addictive behaviors with strategic interventions for maladaptive personality features. Subjects completed the MCMI-I, MCMI-II, and Symptom Checklist-90 (Derogatis, Lipman, & Covi, 1972) at intake, again when they completed treatment, and a third time 6 months later. Results found high levels of PD traits among all subjects. Patients who received PETAD stayed in treatment longer, stayed sober longer, and spent less time drinking posttreatment than patients who received CTAD, although few differences reached statistical significance.

Other treatment studies. MCMI-II scale scores were used to predict additional help-seeking ($n = 130$) in SAs within 1 year of receiving psychodynamic group treatment (Jensen, Mortensen, & Lotz, 2010). A pre-post treatment decline on the Antisocial PD scale was associated with increased help-seeking, whereas higher levels of PD traits and symptoms of anxiety were found to differentiate patients who dropped out of treatment early versus later. In a subsequent study by these investigators of 329 patients, treatment dropout ($n = 68$) was linked to high scores on the MCMI-II Antisocial scale (Jensen, Mortensen, & Lotz, 2014). However, this correlation only held for those who dropped out of treatment late, and reported additional cognitive and somatic anxiety symptoms. Early dropouts had higher scores on the MCMI-II Compulsive PD scale, more symptoms of agoraphobia, and lower interpersonal sensitivity than late dropouts and treatment completers. Lotz and Jensen (2006) studied symptomatic changes following psychodynamic group therapy in outpatients diagnosed with neurotic affective disorders ($n = 139$) or PDs ($n = 53$). Individuals were grouped on the basis of clinician-rated high ($n = 73$) versus low ($n = 66$) Oedipal concerns. Contrary to expectations, the high-level Oedipal group did not show greater symptom improvement posttreatment than the low-level group. Low-level neurotic patients and high-level PD patients showed the most improvement after controlling for pretreatment levels. Post hoc analyses showed that the high-level group obtained higher scores on the MCMI-II Dependent scale than low-level subjects, whereas low-level subjects scored higher on the Antisocial and Aggressive scales. A sizable "asymmetric" group (i.e., high-level subjects with PDs and low-level subjects with neurotic disorders) obtained higher scores than the others on the Schizoid, Avoidant, Self-Defeating, and Schizotypal scales.

Lečić-Toševski and Divac-Jovanović (1996) examined the effects of depressed mood on the MCMI-II profiles of 28 outpatients with dysthymic disorder who completed the measure before and after treatment. All patients were judged

asymptomatic of depression following treatment; however, only 15 showed significant improvements on the MCMI–II (i.e., declines on the Avoidant, Passive-Aggressive, Borderline, and Schizotypal scales, and an increase on the Narcissistic scale). The investigators concluded that this group demonstrated alterations in personality functioning based on the presence or absence of depressed mood, especially with regard to borderline traits, whereas those who showed no changes on the MCMI–II manifested a permanent characterological affective syndrome with core borderline traits.

Three forms of cognitive-behavioral therapy (CBT) were compared in a sample of 21 patients with major depression (Besteiro-González & García-Cueto, 2000): a pure form, a form combined with relaxation, and a form with hypnosis. As indicated by significant changes on all MCMI–II PD and CS scales, CBT in combination with hypnosis was most effective.

DISCUSSION

This review of international MCMI research covered all published studies on construct validity of the various tests adaptations, but space limitations required that we narrow our focus to applications in mental health settings. Even with this limitation it is clear that the international research covered a wide variety of domains, and that the studies are of good quality.

There was strong evidence for the Danish, Dutch, and Spanish translation projects in terms of aspects of construct validity and comparability with the U.S. originals. As the translation procedure of psychological tests has been optimized and protocolized during the past several years, the MCMI–III can be seen as equivalent across the various languages in which it appeared. Yet, the clinical use is limited in terms of making categorical diagnoses: Development of BR scores and associated diagnostic cutoff points was problematic due to differences in patient groups across nations. Available diagnostic studies were problematic or could only support the use of the MCMI–III as a screening device.

Notwithstanding, we believe the MCMI will remain attractive for clinical practice because its scales and associated maladaptive traits are consistent with the *DSM* classification, the most important nosology outside the United States. Even more important is that a dimensional approach to psychopathology is gaining acceptance internationally, and within this approach the MCMI–III is still highly up-to-date. For instance, Rossi, Elklit, and Simonsen (2010) produced empirical evidence for a four-factor framework of PD organization using Belgian ($N = 1,210$) and Danish ($N = 2,030$) clinical and forensic MCMI–III data. A multigroup confirmatory factor analysis resulted in the identification of four factors: emotional dysregulation versus stability, antagonism versus compliance, extraversion versus introversion, and constraint versus impulsivity. These are exactly the four domains that Widiger and Simonsen (2005) identified as being predominant within dimensional models and were therefore included in *DSM–5* (American Psychiatric Association, 2013) Section III labeled as Negative Affectivity, Detachment, Antagonism, and Disinhibition. Although applied in students, their relatives, and friends, a similar MCMI–III four-factor structure has been found in a Spanish sample (Cuevas, García, Aluja, & García, 2008).

Work remains to be done. The MCMI is unique in the way its standardized scores are calculated (by not applying norm referencing). Although criterion referencing—the method currently used—takes the prevalence of disorders into account, developing BR scores has often been problematic. One difficulty facing international investigators of the MCMI–III was that initial (Millon, 1994) diagnostic validity statistics were much lower than those obtained in a later study (Millon, 1997), the results of which are thought to be inflated (Hsu, 2002). However, issues of diagnostic accuracy are not unique to the MCMI or its international adaptations. A gold standard for psychiatric diagnosis remains elusive. Although structured interviews seem to have an edge over unstructured interviews and questionnaire assessments in terms of reliability of diagnoses, these are not widely used by clinicians (Strack, 2010). Until we are farther along in developing standardized methods for diagnosing patients, it will remain difficult to create BR scores for any test, including the MCMI, that will be accurate across diverse settings and countries.

Still, switching from norm to criterion referencing is an innovative idea. Moreover, traditional methods of deriving scale scores typically ignore the clinical reality of comorbidity. Millon tried to include this reality in his instruments by using overlapping items, but diagnoses are obtained one scale at a time. Also, defining anchor points on the basis of prevalence rates did not always result in diagnostic precision in terms of categorical diagnoses. Although BR scores created on the basis of ROC analyses hold some promise toward screening purposes, another parametric standard is needed to obtain more diagnostic precision. Millon also tried to identify prototypal characteristics for disorders. Yet, computing of weighted sums (i.e., prototypal items have a double weight) actually ignores the effects of comorbidity of the disorders on the answering pattern, as responses to other scales are not taken into account. On the contrary, the general cognitive diagnosis model framework (Junker & Sijtsma, 2001) allows for the optimal use of information by capturing the interactions among the disorders. Using item scores obtained from the Dutch version of the MCMI–III ($N = 1,210$), de la Torre, van der Ark, and Rossi (2015) examined to which extent a symptom—as described by an item—will be observed given the various combinations of multiple disorders. However, this method is relatively complex, so before this will be useful for norm development in clinical practice, user-friendly software needs to be developed.

Finding an optimal parametric standard remains a challenge. Yet, at the same time it is clear that Millon's thinking had an enormous influence through the application of his instruments across the world. As can be seen from this review, the MCMI stimulated a lot of research both in terms of construct validity and in terms of clinical issues addressed. The rapidly growing research basis on international MCMI applications largely covers the domains mentioned by Millon (Millon, 2009; Millon & Bloom, 2008), and moreover encompasses several other clinical issues. Worldwide researchers and clinicians tend to see Millon's contribution as a rich source of scientific progress in the field of personality and psychopathology, and his dimensional approach is still highly up-to-date and clinically useful. Given the broad array of issues addressed by international studies, we think Millon's influence will certainly stand the test of time in different domains and settings.

Taking into account that this review was limited to the MCMI, it is certainly not a complete coverage of all domains addressed by application of the Millon inventories. In addition, the scope was only on MCMI translation projects and related clinical studies. Actually, to have a complete picture of adaptations, one should also study the appropriateness of the MCMI in different contexts, such as the use of the original language version in the United States in different ethnic groups, and in other countries. Moreover, future studies should address all Millon inventories, including instruments to measure more adaptive personality aspects, to give a more complete picture of Millon's contributions. We are convinced that such studies will further corroborate Millon's enormous legacy worldwide and demonstrate that his work will continue to inspire researchers and clinicians around the world.

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