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MMPI-2 and post-traumatic stress disorder predictors: A meta-analysis

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ABSTRACT. In letteratura sono disponibili numerosi studi che indagano la capacità dell'MMPI-2 di predire la presenza di Disturbo Post-Traumatico da Stress (PTSD) ma i risultati di tali studi non sono tuttavia sempre concordanti. La presente meta-analisi si propone di perseguire due obiettivi: valutare se esistano scale dell'MMPI-2 predittive del PTSD e del *malingering* della sintomatologia di tale disturbo, nonché riuscire a delineare un profilo tipo di soggetti con PTSD e soggetti *Faker* che, di contro, simulano la presenza o esagerano l'intensità del proprio quadro sintomatologico. I metodi usati sono la revisione sistematica e meta-analisi paired e network degli articoli seguendo le linee guida *PRISMA* e i più importanti database elettronici. Il presente lavoro è il primo che analizza le scale cliniche e le scale di validità che sono in grado di profilare lo stile di risposta tipico dei soggetti con PTSD e *Faker*, utile per predire la vulnerabilità dei soggetti al PTSD. Le analisi effettuate confermano che le scale cliniche 1 (Hs), 2 (D), 6 (Pa), 7 (Pt), 8 (Sc), le scale specifiche del PTSD (PK e PS) e le scale di validità (L, K, F, FB, FP) sono capaci di discriminare i soggetti con PTSD dalla popolazione generale.

SUMMARY. There are numerous studies available in literature that examine the capacity of MMPI-2 to predict the presence of Post-Traumatic Stress Disorder (PTSD) but the results of these studies are not always concordant. This meta-analysis has two objectives: to assess whether MMPI-2 scales exist in predicting PTSD and malingering of the disorder, as well as to define a typical profile for PTSD subjects and Faker subjects, who feign or exaggerate the intensity of their symptoms. The methods used are systematic review, pair-wise and network meta-analysis of the articles, following the PRISMA guidelines and the most important electronic databases. This work is the first of its kind to analyse clinical scales and validity scales able to profile response styles typical of subjects with PTSD and Fakers, useful in predicting subjects' vulnerability to PTSD. The analyses performed confirm that clinical scales 1 (Hs), 2 (D), 6 (Pa), 7 (Pt), 8 (Sc), specific PTSD scales (PK and PS) and validity scales (L, K, F, FB, FP) are able to discriminate subjects with PTSD from the general population.

Keywords: *MMPI, MMPI-2, PTSD, Trauma, Fakers, Malingering, Meta-analysis, Scale, Profile*

INTRODUCTION

An individual who is the victim (real or potential) or the spectator of events that threaten his/her own life or the life of others can develop *Post-Traumatic Stress Disorder* (PTSD). Classified as an anxiety disorder in DSM-IV-TR and as a disorder correlated to traumatic and stressful events in DSM-5, the incidence of PTSD is estimated to vary between 1% and 14% in the United States (American Psychiatric Association, 2007). PTSD rates very much depend on the nature of the event that caused the trauma. As observed by the National Institute of Mental Health (NIMH; EpiCentro, Italian National Institute of Health), PTSD can develop, for instance, in 2% of survivors after a natural disaster, in 28% of people involved in a mass terrorist attack, and in 29% of survivors and family members of victims of airplane crashes. There is only one study in Italy (Di Giorgio et al., 2003) that assesses the incidence of the disorder, considering the population affected by the earthquake in San Giuliano di Puglia. This study observes how 14% of the adults interviewed had possible PTSD, while the children and adolescents proved to be the category most at risk (49%).

The DSM-IV-TR criteria to diagnose PTSD will be presented further on, as they are referenced by the studies under examination. A PTSD diagnosis requires the person to have directly experienced or witnessed a traumatic event that threatens his/her physical integrity or the physical integrity of others (such as serious injury, sexual violence, natural catastrophes, war experiences, or serious accidents), which is associated to intense fear and feelings of impotence or horror (Criteria A). PTSD is characterised by three clusters of symptoms: (a) the traumatic event is relived persistently (for example: recurrent, involuntary, and intrusive flashbacks or nightmares); (b) persistent avoidance of trauma-related reminders and negative alterations in trauma-related cognition and mood (for example: trying to avoid unpleasant memories, feeling detached or estranged from others); (c) alterations in arousal (for example: irritable behaviour or problems in concentration, hypervigilance). In addition, this disorder stands out for its high rate of comorbidity, such as depression, panic attacks, substance abuse, dissociative symptoms, and personality disorders. This is why a multidimensional approach is recommended in clinical practice. The *Minnesota Multiphasic Personality Inventory – 2* (*MMPI-2*; Butcher et al., 1995, 2011) is one of the most widely used of the various tools (Greene, 2000) that have been developed to assess psychopathology and personality. This self-reporting tool consists of 567 "True/False" items and numerous specific scales to assess PTSD symptoms and various associated comorbidities (10 clinical scales, 16 supplementary, 15 content, 5 PSY-5, *Personality Psychopathology Five Scale*, and 27 subscales related to components of the content scales, 28 Harris-Lingoes subscales, and 3 subscales). The eight validity scales also allow malingering (Scheibe, Bagby, Miller & Dorian, 2001), or feigning illness, to be identified.

Most research conducted on using the MMPI-2 to assess PTSD focus on using two specifically developed scales to evaluate how the symptoms of this disorder are configured: *PTSD-Keane* (PK; Keane, Malloy & Fairbank, 1984) and the *PTSD-Schlenger* scale (PS; Schlenger & Kulka, 1989). The PK scale was developed by comparing psychiatric patients from the Veterans Administration Department with various Axis I diagnoses who manifested signs of PTSD to those who did not present this clinical condition. This scale was used with another group of patients from the Veterans Hospital and found confirmation in the cross-validation, also known as cross-validity, which consists in verifying the results obtained on a second independent sample of subjects. The PS scale, instead, was built by comparing Vietnam veterans with good emotional adaptation to those who manifested symptoms typical of PTSD. These two scales are independent from each other and can be used simultaneously for better diagnostic classification (Butcher et al., 1995, 2011). There is no unambiguous consensus on the predictive capacity of these two scales. Indeed, various others have suggested that the two scales are able to discriminate general maladjustment and emotional distress from PTSD in the strict sense of the term (Greene, 2000; Moody & Kish, 1989; Wise, 1996).

Another line of studies concentrated on the 10 clinical scales in the MMPI-2 in PTSD patients in order to profile the response styles and peak elevations typical of the disorder. In analysing the clinical scales of veterans with PTSD, there is often significant elevation in scale 2 (D; *Depression*) and scale 8 (Sc; *Schizophrenia*). The first reflects feelings of discouragement, pessimism, desperation, and personality aspects regarding an excessive sense of duty, aspirations to high standards, and the tendency to be intropunitive, while the second measures a wide variety of oddities, unusual experiences, and particular perceptions that are characteristic of how schizophrenia manifests. Profiles with elevations in these two scales are often coded as 28/82 (Fairbank, Keane

& Malloy, 1983; Frueh, Hamner, Cahill, Gold & Hamlin, 2000; Lyons & Wheeler-Cox, 1999; Orr et al., 1990; Talbert et al., 1994; Wilson & Walker, 1990; Wise, 1996). Studies that used the MMPI-2 with Vietnam veterans report peak elevations also in Scale 7 (Pt; *Psychasthenia*), correlated to a general state of anxiety and worry, adherence to high moral standards, self-criticism, and impulse control. This scale often proves to be higher than scale 2 (D; Albrecht et al., 1994; Baldrachi, Hilsenroth, Arsenault, Sloan & Walter, 1999; Forbes, Creamer & McHugh, 1999; Litz et al., 1991; Wetter, Baer, Berry, Robinson & Sumpter, 1993; Weyermann, Norris & Hyer, 1996). This suggests that a typical PTSD profile could be characterised as an 87/78 three-point code with scale 2 (D) following closely. Furthermore, in studies that focused on Gulf War veterans, there were elevations in scale 1 (Hs; *Hypochondria*), which reflects general concern with one's body or self, and scale 8 (Sc), leading back to an 18/81 code (Glenn et al., 2002). Studies on Croatian war veterans (Begic & Jokic-Begic, 2007) show very high elevations in scales 1 (Hs), 2 (D), and 3 (Hy, *Hysteria*); the latter reflects specific physical disorders or agitation, as well as denial of problems in their lives or lack of social anxiety. Validity scales complete these PTSD profiles. Many studies show that patients with PTSD often score higher in the F scale (*Frequency*), which measures the exaggeration of symptoms and detects atypical responses, and score lower in the L (*Lie*) and K (*Correction*) scales, which reflect the tendency to present the most favourable self-image and downplaying a psychological condition, respectively. The wide diversification of MMPI-2 profiles among the studies examined is most likely caused by the wide variability of the sample, the symptoms of the disorder itself, and the traumatic events (Elhai, Gold, Sellers & Dorfman, 2001; Rademaker, Kleber, Meijer & Vermetten, 2009).

There are other lines of research on the use of the MMPI-2 in assessing PTSD in literature that concentrate on patients that feign or exaggerate their symptoms: this phenomenon is known as *malingering*. This technical term indicates deliberately exaggerating or inventing physical or psychological symptoms in order to obtain some external benefit (American Psychiatric Association, 2007). There are many reasons that lead subjects to feign and/or exaggerate PTSD symptoms: for example, the possibility of receiving financial gain; the possibility of receiving treatment; in legal settings, it can be used to obtain the insanity defence and/or a reduced sentence (Elhai, Frueh, Gold, Gold & Hamner, 2000; Frueh et al., 1996; Resnick, 1997). These subjects that deliberately exaggerate for an external gain can be defined as *suspected malingerers*. However, as stated by van Impelen, Merckelbach, Jelicic and Merten (2014) not all subjects that exaggerate/invent symptoms can be defined as malingerers, as not all of them do it for an external benefit. What the tests can show is whether or not the symptoms are being exaggerated but it is not possible to detect the motive behind subjects presenting an exaggerated view of their condition (Boone, 2007). Literature shows that the incidence of *malingering* varies considerably. In reviewing literature by Rogers (2008), it was found that the incidence of *malingering* in forensics varies from 15.7% to 17.4%, with a large standard deviation of 14.4% (Rogers, Salekin, Sewell, Goldstein & Leonard, 1998). On the whole, subjects who feign/invent symptoms of mental illness were observed as often having the tendency to exaggerate in the generalisation. They might feign both specific symptoms of a psychiatric condition and cognitive deficits (in the sense that they might exaggerate the presence of symptoms and score poorly on cognitive tests). In addition, malingerers present their cognitive deficits in an extremely generalised manner more frequently than those who actually suffer from such conditions (Alwes, Clark, Berry & Granacher, 2008; Green, Rosenfeld, Belfi, Rohlehr & Pierson, 2012; Heinze & Purisch, 2001). However, malingerers might also be highly selective in presenting their symptoms or deficits. Indeed, if these subjects are clever or have gleaned information on the symptoms of the disorders, they will also be able to establish their account of the symptoms experienced using signs and symptoms specific to a particular disorder or disability. Given the importance of the phenomenon and the great variety of how the "feigned" symptoms are presented, most researchers and clinics currently agree that the clinical determination of malingering should not rely solely on a single measure and, as such, on a single tool; rather, it should use a series of tools and scales that are able to detect the various feigning strategies (Boone, 2009; Bush, Heilbronner & Ruff, 2014; Bush et al. 2005; Chafetz et al. 2015; Rogers, 2008; Rogers & Bender 2018). In recent years, literature has shown a growing focus on studies that use various tools to detect different feigning strategies used by subjects and how their test scores differ from subjects that actually experience a psychological and medical condition. Most of these studies concentrate on nonclinical samples coached to feign symptoms (*experimental simulators*), that is, subjects who were never diagnosed with any psychopathologies and were taught to fake experiencing the symptoms typical of a specific disorder, following the

criteria validated and standardised for simulation studies (Giromini et al., 2019). To date, there are several multiscale personality inventory tests that include one or more validity indicators designed to detect atypical response styles and exaggeration of symptoms. Of these, the MMPI-2 is likely the most used. Indeed, the MMPI-2 contains numerous scales that specifically recognise symptom exaggeration among people coached to feign them and the presence of actual disorders in subjects who actually have a disorder. Many studies focus on people who exaggerated/feigned having experienced symptoms characteristic of PTSD. Franklin & Thompson (2005), analysing all the studies focusing on using the MMPI-2 in assessing malingering, observed that the most widely used scales and indices are the F scale (*Frequency*); the FB scale (*Frequency-Back*), which examines the tendency to give unusual responses in the second half of the test; the FP scale (*Frequency-Psychopathology*), which measures responses pertinent to psychopathological aspects and infrequently provided by the general population; the F-K index (Gough Dissimulation Index), which indicates the tendency to control responses (*underreporting*) or an extremely high presence of symptoms (*overreporting*). Of these, the F and FB scales are more useful in assessing whether symptoms are being exaggerated. Most studies in literature tend to confirm the efficacy of the F family validity scales in the MMPI-2 (F, F_B e F_P) in differentiating the response styles of subjects who have been coached to exaggerate PTSD symptoms in exchange for monetary compensation (Bagby, Buis & Nicholson, 1995; Bagby & Marshall, 2005; Rogers, Sewell, Martin & Vitacco, 2003; Rogers, Sewell & Salekin, 1994). Instead, other studies suggest that these scales have no true predictive capacity in differentiating fakers from subjects actually suffering from the disorder (Babgy, Marshall & Bacchiochi, 2006; Elhai et al., 2000; Elhai et al., 2001; Elhai et al., 2002; Rogers et al., 2003). There are various explanations for this diversity of opinions in literature. One is that the reduced predictive capacity of validity scales is given by the fact that they assess the general response strategies typical of fakers and not specific to a certain disorder. Another possible reason is the fact that subjects with PTSD often have very serious and varied symptoms. This could lead to assessing peak elevations as untruthful in the F, FB and FP scales and, as a result, also believing that subjects who actually have PTSD are faking (Marshall & Bagby, 2006).

This work integrates into the range of literature on the use of the MMPI-2 to assess PTSD, using a meta-analytical approach in order to verify which MMPI-2 scales are truly useful in evaluating subjects with PTSD. The study has the following objectives: (a) identify the scales that prove to be important in predicting the symptoms typical of subjects suffering from PTSD; (b) identify the scales that allow subjects suffering from PTSD to be distinguished from those who feign/exaggerate the symptoms of the conditions (for the sake of clarity, these subjects shall be called Fakers; for further specification on the subjects from the various studies, see the Appendix 2, tab. A2-2); (c) create prototype profiles of subjects with PTSD and fakers. To achieve these objectives, in accordance with literature, this work will focus on validity scales and indices (L, K, F, F_B, F_P, F-K), as well as 9 of the 10 clinical scales (1, 2, 3, 4, 6, 7, 8, 9, 0). The decision was made not to consider scale 5 (Mf; *Masculinity/Femininity*) given that it requires a different standardisation process for men and women and because it was deemed unnecessary for the purpose of this study.

METHODS

The meta-analysis presented in this study was carried out following the PRISMA guidelines (Liberati et al., 2015).

Eligibility criteria

The eligibility criteria of the studies were presented according to the PICOS model (*participant*, *intervention*, control, *outcome*, *study design*). For the first objective, studies were included if: (a) they measure the presence of PTSD or Fake-PTSD with MMPI-2; (b) they require a control sample for the outcomes of interest; (c) they present the results of the study regarding the outcome (PTSD and Fake-PTSD) and report the characteristics of the sample; (d) they present the results for the outcomes of interest using case-control studies, cohort studies, randomised control trials (RCT); (e) they were published in English or Italian.

For the second objective, studies were included according to less restrictive criteria in terms of the types of studies permitted, extending them even to cross-sectional studies and analyses of case studies.

For both objectives, studies were excluded if: (a) they use qualitative research studies or single cases; (b) they are editorials, conference abstracts, abstracts, reviews; (c) it was not possible to obtain the full text.

Research strategy

Research was carried out using the most important electronic databases (PsycINFO, PsycTESTS, Web of Science, PubMed, EMBASE, CINAHL, Cochrane), also using *Medical Subject Headings* (*MeSH*). The terms used to search for the studies in all the databases were: *Minnesota Multiphasic Personality Inventory*, *MMPI-2, PTSD*, *trauma, Post-traumatic stress disorder, scale, subscale, diagnosis*. The following is the search string used:

(Minnesota Multiphasic Personality Inventory 2 OR MMPI-2) AND *(PTSD OR trauma OR Post-traumatic stress disorder)* AND *(scale OR subscale OR diagnosis)*

The bibliography search was carried out by examining all studies published until 09.17.2019.

Data extraction and quality assessment

Initially, three psychologists (Giuseppe Agrusti, Luca Mandolesi and Claudia Scalise) screened the titles and abstracts. When there was a doubt as to the eligibility of the study, the article was then read in full. While articles were being read in their entirety, the studies were evaluated based on information regarding: (a) population; (b) PTSD assessment tools; (c) control population; (d) results; (e) research design. Two researchers (Giuseppe Agrusti and Paola Tellaroli, see. Appendix 1) independently assessed the quality of the included studies, using the *Newcastle-Ottawa Scale* (*NOS*; Wells, et al., 2012) and its version adapted for cross-sectional studies (Modesti, et al., 2016).

The NOS scale assesses the quality of non-randomised trials, according to three parameters (*selection*, *comparability*, *exposure*) measured by eight items, which differ slightly for case-control and longitudinal studies. At most one point can be assigned to each item on the scale, with the exception of the *comparability* parameter, for which the maximum score is two points. Scores, therefore, can range from 0 to 9. The higher the score, the better the quality of the study. The specific version for cross-sectional studies consists of seven items, which can be assigned a maximum score of 10. In this work, the studies with a score lower than 4 were identified as having a high risk of bias and, therefore, eliminated from the analysis.

The total scores of each study are divided based on the total possible score. Studies with scores >75% were considered as being of *high quality*, those with scores ≥50% as being of *moderate quality*, and studies with scores <50% as being of *low quality*.

Statistical analysis

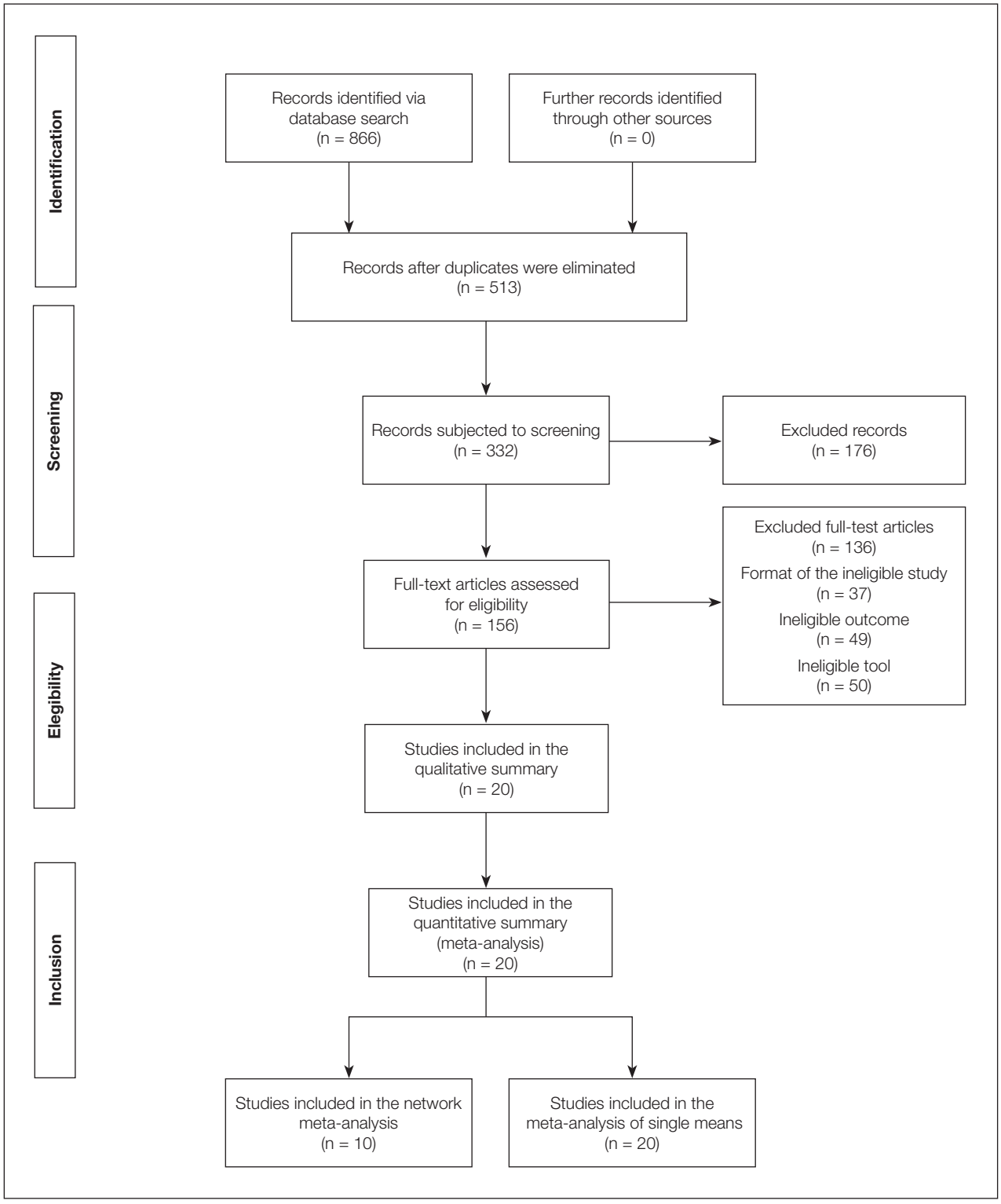
Pairwise and network meta-analyses with a frequentist approach were carried out using R packages (version 3.6.1 for Windows; R Core Team, 2019) *meta* (Schwarzer, 2007) and *netmeta* (Rücker, Krahn, König, Efthimiou & Schwarzer, 2019). Shapiro-Wilk tests for normality were run before aggregating the data if the number of combined studies was greater than 3 (Royston, 1995). Network meta-analyses of the mean difference (*MD*) were carried out for the first objective. A pairwise meta-analysis of the individual means for each scale of interest was carried out for the second objective, using the inverse-variance grouping method. Where there was no standard deviation, two different solutions were adopted: if there were statistics that allowed an estimate to be made, they were used (Higgins & Green, 2011); otherwise, thevalue was taken from another similar study included in the analysis (Furukawa, Barbui, Cipriani, Brambilla & Watanabe, 2006). Both fixed-effect and random-effects models were applied. The first used the inverse-variance weighted estimate, while the second used the DerSimonian-Laird estimate (DerSimonian & Laird, 1986) to take into account heterogeneity, quantified using the I^2 statistic. An I^2 ≥50% value indicated substantial heterogeneity (Higgins & Thompson, 2002), which, in that case, was explored via influence analysis, using the exclusion method (Cooper & Hedges, 1994). Funnel plots and testing for their asymmetry, based on a weighted linear regression of the treatment effect on its standard error (Egger, Smith, Schneider & Minder, 1997), were used to assess possible publication bias if the number of studies was greater than or equal to 10 (Sterne et al., 2011). All p values were two-tailed, with statistical significance set at less than .05.

RESULTS

Selection of the studies

The study selection process is described in Figure 1. Overall, 866 bibliographic citations were identified, which were reduced to 20 studies that meet the eligibility criteria

Figure 1 – Flow chart (PRISMA, 2009)



after several stages of verification. Thereafter, network meta-analyses were carried out for the first objective with 10 of the 13 selected studies, as the remaining (Arbisi, Ben-Porath & McNulty, 2006; Lange, Sullivan & Scott, 2010; Lees-Haley, 1992) had received a score of 3 in the quality assessment and, therefore, were considered as having a high risk of bias. In fact, the Lange study (Lange et al., 2010) presents a sample of solely university students as experimental and control subjects and there is no clear distinction between the two groups, in the Arbisi study (Arbisi et al., 2006), there is a percentage of subjects with PTSD even in the control sample, the experimental subjects in the Lees-Haley study (1992) do not meet criteria A of PTSD diagnosis (considered, therefore, pseudo-PTSD). The 10 selected studies were included as they provided for a clinical sample (subjects with PTSD and/or Fake-PTSD) and a control sample. For our second study, pairwise frequentist meta-analyses were carried out on the individual standardised means for each scale of interest using all 20 selected studies, as we were interested in using the highest possible number of means of the MMPI-2 scores from subjects with PTSD or Fake-PTSD and control samples, regardless of the fact that those samples were compared in the various studies.

Participant characteristics

Participant characteristics are described in the Appendix 2.

Assessment tools

The studies examined used various assessment tools in addition MMPI-2. Only two studies (Albrecht et al., 1994; Litz et al., 1991) use both the MMPI-2 and the MMPI to make a comparison between the two versions in assessing PTSD. The *Structured Clinical Interview for DSM* (*SCID*; Spitzer, Williams & Gibbon, 1987) is often used to diagnose PTSD. The interview is structured to diagnose most Axis I disorders and Axis II personality disorders, according to the DSM (Albrecht et al., 1994; Elhai et al., 2000; Glenn et al., 2002; Litz et al., 2010; Marshall e Bagby, 2006; Scheibe et al., 2001; Tolin et al., 2004; Weyermann et al., 1996). Other tools are associated to the interview, such as the *Mississipi Scale for Combat-Related PTSD* (*M-PTSD*; Keane, Caddel & Taylor, 1988), which is a diagnostic measure for combat-related PTSD (Albrecht et al., 1994; Glenn et al., 2002; Litz et al., 2010; Munley, Bains, Bloem & Busby, 1995; Rademaker et al., 2009; Tolin et al., 2004); the *Clinician Administered PTSD Scale* (*CAPS*; Blake et al., 1995), a clinical assessment scale for PTSD consisting in 30 items administered by a clinic qualified to assess PTSD symptoms, including their frequency and severity (Eakin et al., 2006; Elhai et al., 2000; Forbes et al., 1999; Glenn et al., 2002; Rademaker et al., 2009; Tolin et al., 2004); the *Posttraumatic Stress Disorder Checklist* (*PCL*; Weathers, Litz, Herman, Huska & Keane, 1993), a 17-item self-reporting tool that corresponds to DSM criteria for PTSD, used to measure symptom severity (Eakin et al., 2006; Forbes et al., 1999); the *Davidson Trauma Scale* (*DTS*; Davidson et al., 1997), a 17-item self-reporting tool that corresponds to DSM-IV symptoms and yields a total score and one corresponding to PTSD criteria B, C, and D (Glenn et al., 2002); the *Computerized Diagnostic Interview Schedule* (*C-DIS*; Blouin, Perez & Blouin, 1988), a structured interview to diagnose DSM-III-R disorders, in the Munley et al study (1995) only the part for PTSD diagnosis is used; finally, the *Self-Rating Inventory for PTSD* (*SIP*; Hovens, Bramsen & van der Ploeg, 2000), consisting of 22 items that correspond to clusters B, C, and D of the DSM-IV for PTSD (Rademaker et al., 2009).

These assessment tools are associated with tools to gather information on the traumatic events experienced by the subjects being examined: the *Combat Exposure Scale* (*CES*; Keane, Wolfe & Taylor, 1987), a 7-item tool with Likert scale, which measures the level of wartime stressors experienced (Albrecht et al., 1994; Forbes et al., 1999; Litz et al., 2010; Munley et al., 1995); the *Life Events Checklist* (*LEC*; Blake et al., 1995), a measure of exposure to potentially traumatic events, developed in conjunction with the CAPS to facilitate PTSD diagnosis (Eakin et al., 2006); finally, the *Impact of Event Scale* (*IES*; Horowitz et al., 1979), a 15-item set to assess the amount of distress associated to a specific event (Elhai et al., 2004).

To assess PTSD comorbidity, Glenn et al. (2002) use the *Cook-Medley Hostility Scale* (*Cook-Mendeley*; Barefoot, Dodge, Peterson, Dahlstromwi & Williams, 1989), an abbreviated form of the original scale consisting of 27 items to measure cynicism, hostility, and aggression; the *Beck Depression Inventory* (*BDI*; Beck & Steer, 1987; Beck, Steer & Garbin, 1988), a 21-item self-reporting tool that measures the general severity of depressive symptoms; the *State-Trait*

Anxiety Inventory (*STAI*; Spielberger, 1983), a 40-item self-reporting tool that measures state and trait anxiety.

Some studies assess overall functioning of the subjects examined (Munley et al., 1995; Scheibe et al., 2001) using the *Shipley Institute of Living Scale* (*SILS*) to measure intelligence, or the *Global Assessment of Functioning Index* (*GAF*; American Psychiatric Association, 2007) to assess the severity of mental illness and to what degree the symptoms influence the person's daily life on a scale of 0 to 100.

Configuration of the MMPI-2 scales in subjects with PTSD and in fakers

Network meta-analyses were carried out for the studies considered to be of at least moderate quality and with a control group for the 6 recurring clinical scales in literature (Hs; D; Hy; Pd; Pt; Sc; see Fig. 2), validity scales (F, F_B, F_P; see Fig. 3), and a specific PTSD scale (PK; as PS scores were only available for one study; see Fig. 4) to assess which of these scales was more significant in differentiating a subject with PTSD or fakers from the control group.

Clinical scales

Carrying out a network meta-analysis on the clinical scales, clinical scale 1 (Hs) shows a significant difference between the control group and the group with PTSD (*MD* = 20.41, CI 95% = [7.91; 32.90], *k* = 2) and the group of fakers (*MD* = 32.46, CI 95% = [18.18; 46.74], *k* = 3). Instead, when comparing the experimental group (PTSD) and the group of fakers, there is a trend in which the fakers score higher on average than the subjects with PTSD but these scores did not prove significant owing to overlapping confidence intervals. This result could be explained by high heterogeneity (I^2 = 92.5%), likely due to the scarce number of studies taken into consideration (*k* = 4), to the different nationalities of the subjects considered, and to the fact that one of the studies (Rademaker et al., 2009) involves armed peacekeepers and not actual war veterans.

As regards the network meta-analysis of scale 2 (D), there is a similar trend, that is, an evident significant difference between the control group and the group with PTSD (*MD* = 19.82, CI 95% = [11.60; 28.04], *k* = 4) and the group of fakers (*MD* = 28.56, CI 95% = [18.81; 38.31], *k* = 4). Analysing the differences between the experimental group and the group of fakers, there is a similar general trend with fakers scoring higher than subjects with PTSD but it is not possible to confirm that those with the disorder can actually be discriminated from those who are faking. This result could be explained by high heterogeneity (I^2 = 89.2%), which disappears by eliminating the studies by Elhai et al. (2000) and Marshall et al. (2006). It was not possible to formulate an explanation for this heterogeneity from the data in our possession.

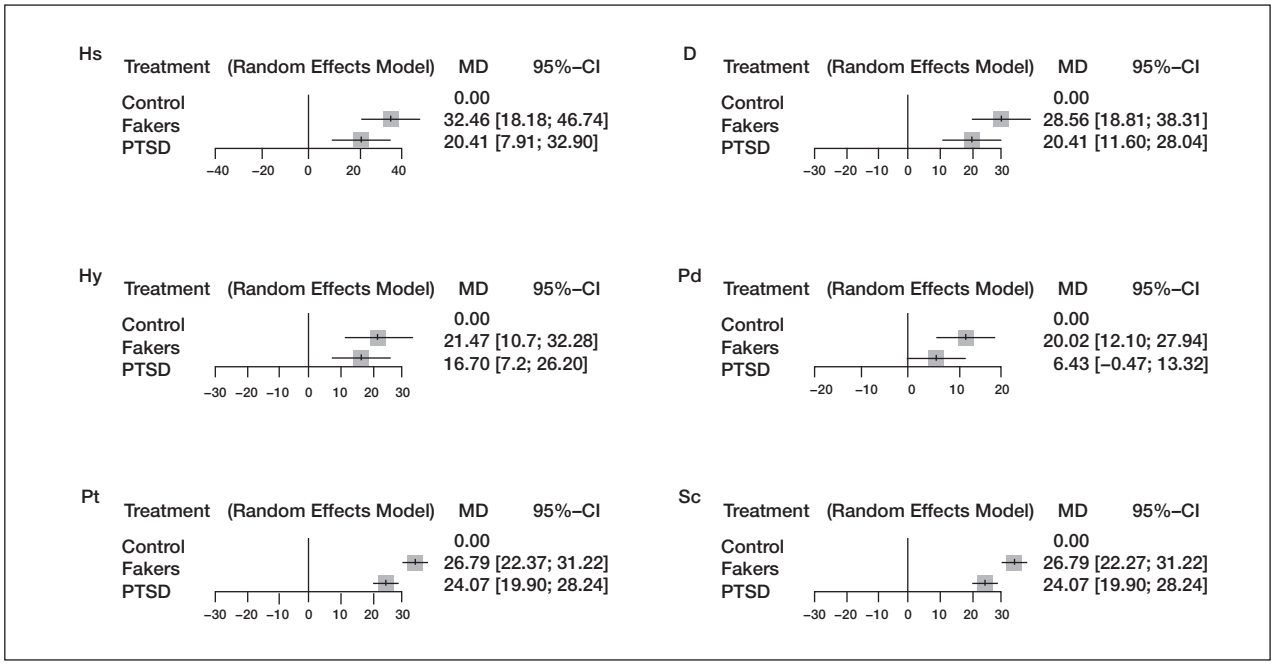
Observing the results for scale 3 (Hy), it is immediately evident that there is a clear significant difference between the control group of subjects with PTSD (*MD* = 16.70, CI 95% = [7.2; 26.20], *k* = 2) and the fakers (*MD* = 21.49, CI 95% = [10.7; 32.28], *k* = 3), but if the results of the two groups are compared against each other, once again, there is no true discriminating capacity (I^2 = 88.6%), likely due to the scarce number of studies (*k* = 4) examined.

Analysing the differences for scale 4 (Pd), there is a significant difference between the control group and the group of fakers (*MD* = 20.2, CI 95% = [12.10; 27.94], *k* = 3), but it is not possible to confirm this as regards the difference between the control group and the group with PTSD (*MD* = 6.43, CI 95% = [–.47; 13.32], *k* = 2). This could, once again, be due to the scarce number of studies available and to the subsequent high heterogeneity (I^2 = 80.5%) in the studies.

For scale 8 (Pt), significant differences stand out between the control group and the fakers (*MD* = 26.79, CI 95% = [22.37; 31.22], *k* = 3) and the group with PTSD (*MD* = 24.07, CI 95% = [19.90; 28.24], *k* = 1), but this difference does not prove significant between the experimental group and the group of fakers. In fact, the trend is similar to the other clinical scales; that is, fakers scored higher than the experimental group but it is not possible to differentiate them from subjects who actually experience the constellation of symptoms typical of the disorder.

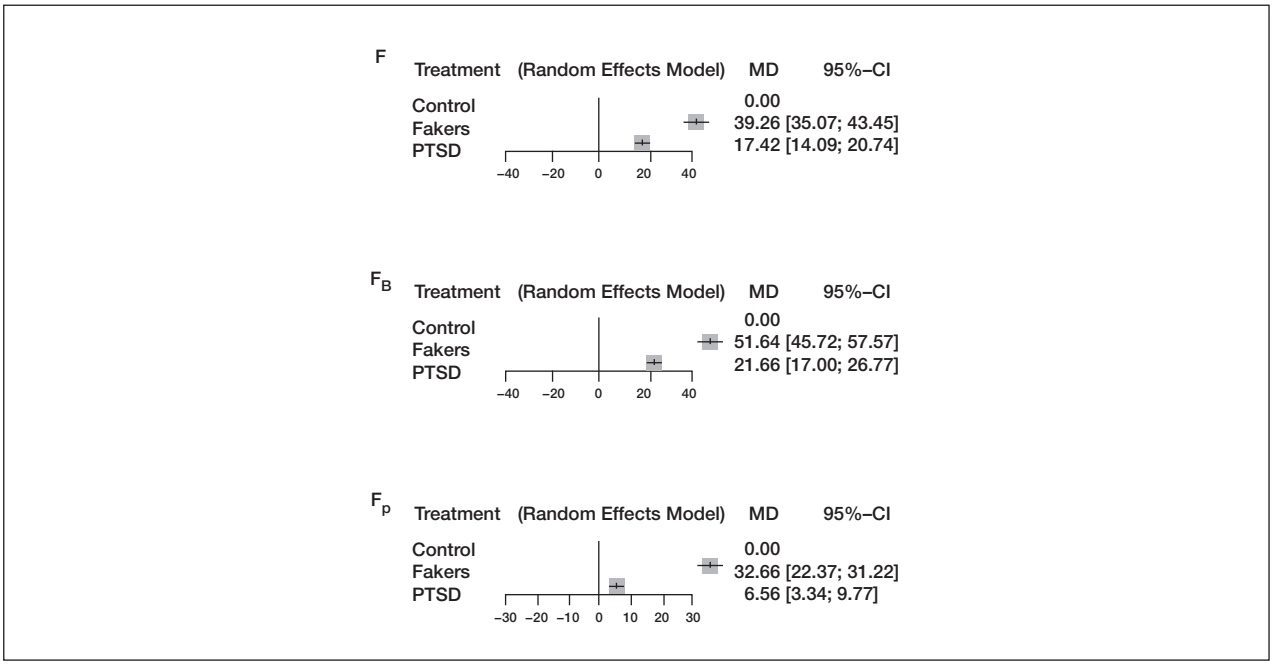
Finally, analysing the results of the network meta-analysis carried out for scale 9 (Sc), there is a significant difference between the control group and the group with PTSD (*MD* = 24.07, CI 95% = [19.90; 28.24], *k* = 1) and the group of fakers (*MD* = 26.79, CI 95% = [22.37; 31.22], *k* = 3), but it is not possible to discriminate the fakers from those who are actually suffering from the disorder. This result could be explained by the scarce number of studies taken into consideration (*k* = 3).

Figure 2 – Forest plot of the clinical scale network meta-analysis



Legenda. Hs = Hypochondria; Hy = Hysteria; Pt = Psychasthenia; D = Depression; Pd = Psychopathic Deviance; Sc= Schizophrenia.

Figure 3 – Forest plot of the validity scale network meta-analysis



Legenda. F = Frequency; F_B = Frequency-Back; F_P = Frequency-Psychopathology.

Validity scales

A network meta-analysis was carried out for the F validity scale, comparing the experimental group (subjects with PTSD) and the group of fakers to the control group. The results highlight the significant differences between the control group and the fakers (*MD* = 39.26, CI 95% = [35.07; 43.45], *k* = 6) and the group with PTSD (*MD* = 17.42, CI 95% = [14.09; 20.74]; *k* = 4; I^2 = 26%).

As regards the F_B validity scale, carrying out a network meta-analysis between the control sample and the other two samples (PTSD and fakers), there is a clear significant difference with the experimental group (*MD* = 21.88, CI 95% = [17.00; 26.77], *k* = 3; I^2 = 41.5%) and the group of fakers (*MD* = 51.64, CI 95% = [45.72; 57.57], *k* = 3), despite moderate heterogeneity (I^2 = 41.5%), due to the scarce number of studies examined.

Finally, the network meta-analysis for the FP scale shows a significant difference between the control sample and the experimental group (*MD* = 6.56, CI 95% = [3.34; 9.77], *k* = 3) and the group of fakers (*MD* = 32.86, CI 95% = [28.47; 37.25], *k* = 5), with low heterogeneity (I^2 = 24.2%), attributable to the study by Elhai et al. (2001), which has mainly female subjects with a history of sexual abuse as its experimental subjects. In fact, by omitting this study, heterogeneity almost completely disappears, confirming a significant difference.

What can be observed from the network meta-analyses is that the validity scales generally have a good discriminating capacity, as the fakers score clearly higher than the control subjects and subjects with PTSD in these scales.

Specific PTSD scale

Given the scarce number of studies presenting data on the *PTSD-Schlenger* (PS) scale, we were only able to analyse the *PTSD-Keane* (PK) scale. Analysing the network meta-analysis of this scale, the trend proved the same, that is, that the group of fakers scored higher compared to the subjects with PTSD. However, in this case there is a significant difference between the two aforementioned groups and the control group but this difference is not significant between the PTSD and faker groups since, as shown in the graph, the confidence intervals tend to overlap (*Fakers MD* = 32.08, CI 95% = [25.15; 39.00]; PTSD *MD* = 20.54, CI 95% = [14.35; 26.73]). This trend could be explained by high heterogeneity (I^2 = 98.1%), due to the scarce number of studies (*k* = 4) and the differences of the samples examined, which differ by gender, age, nationality, and type of war fought (see Fig. 4).

Typical profile of patients with PTSD

Carrying out a pairwise meta-analysis of single means for all 20 studies with MMPI-2 scores of subjects with PTSD and using the Welsh (1948, 1951) coding system, it was possible to sum up all the scores obtained in order to obtain a simple numeric expression that defines a prototype of the typical profile of subjects that present the constellation of PTSD symptoms (see Fig. 5):

82”7163 40’9 / FF_B”F_P-L/K# PKPS”

As can be seen from the Welsh coding system, subjects with PTSD present peak elevations in clinical scales 8 (*M* = 83.33; CI 95% = [79.31; 87.36]) and 2 (*M* = 82.15; CI 95% = [80.20; 84.11]), followed by high elevations in scales 7 (*M* = 79.26; CI 95% = [75.35; 83.18]), 1 (*M* = 76.30; CI 95% = [72.93; 79.67]), 6 (*M* = 76.22; CI 95% = [73.18; 79.25]), 3 (*M* = 74.98; CI 95% = [73.45; 76.51]), 4 (*M* = 71.82; CI 95% = [68.70; 74.94]), 0 (*M* = 70.52; CI 95% = [67.47; 73.58]), and moderate elevation in clinical scale 9 (*M* = 58.48; CI 95% = [55.57; 61.39]). Instead,

Figure 4 – Forest plot of the specific PTSD scale (PK-Keane) network meta-analysis

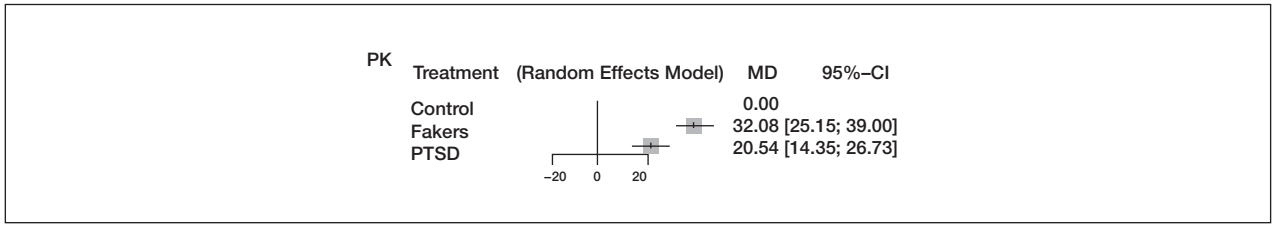
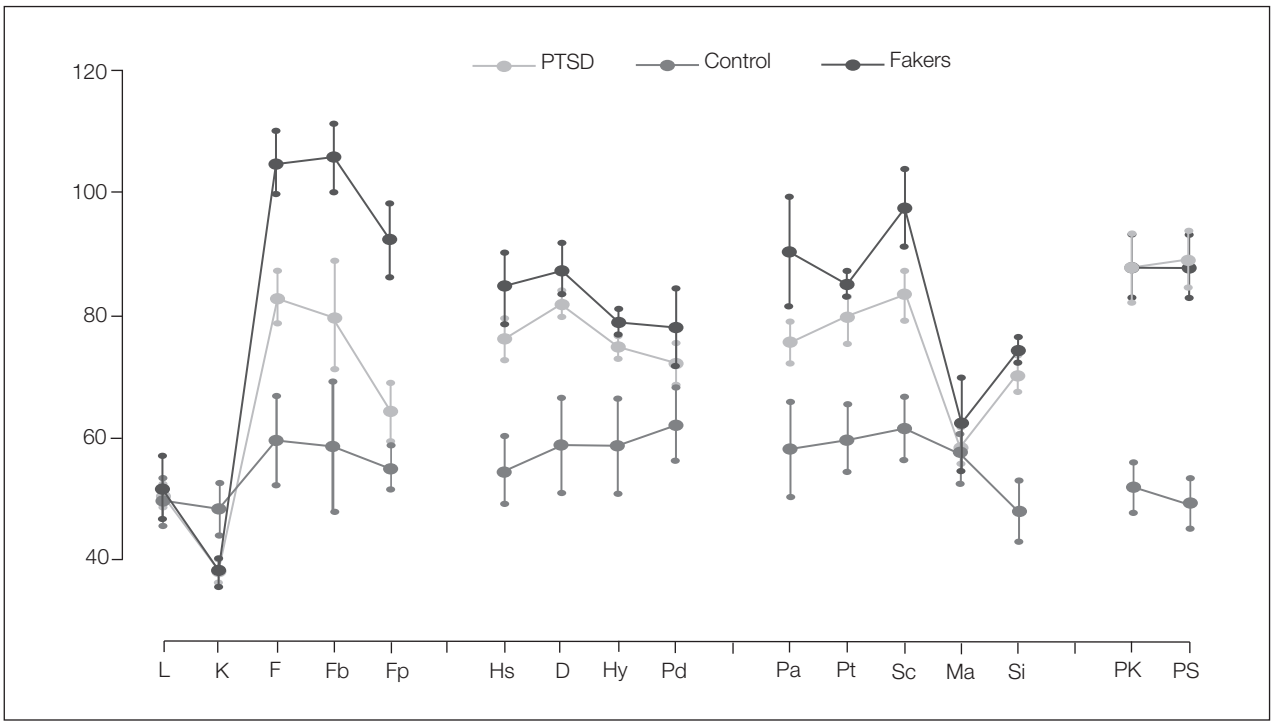


Figure 5 – Graph of the profiles of subjects with PTSD and Faker subjects compared to the control group



Legenda. L = Lie; K = Correction; F = Frequency; FB = Frequency-Back; FP = Frequency-Psychopathology; Hs = Hypochondriasis; D = Depression; Hy = Hysteria; Pd = Psychopathic Deviance; Pa = Paranoia; Pt = Psychasthenia; Sc = Schizophrenia; Ma = Hypomania; Si = Social Introversion; PK = PTSD-Keane; PS = PTSD-Schlenger.

in terms of the validity scales, peak elevations can be noted in the F (M = 83.13; CI 95% = [78.88; 87.39]) and F_B scales (M = 80.06; CI 95% = [70.97; 89.16]), moderate elevation in the F_P scale (M = 64.33; CI 95% = [59.40; 69.26]), mild elevation in the L scale (M = 50.16; CI 95% = [48.44; 51.87]), and low elevation in the K scale (M = 37.53; CI 95% = [36.39; 38.67]). Finally, as regards specific PTSD scales, very high elevation can be observed in the PK (M = 87.95; CI 95% = [82.77; 93.12]) and PS scales (M = 89.27; CI 95% = [84.64; 93.91]).

Typical profile of Fakers

Proceeding with a pairwise meta-analysis of single means for all the studies presenting MMPI-2 scores for fakers, it was possible to sum up the trend of the scores obtained and formulate a simple numerical expression that defines a prototype of the typical profile of fakers (see Fig. 5):

86271”<u>34</u>0’9- F_BF**F_P*L/K# <u>PKPS</u>”

As can be seen from the Welsh coding system, subjects with PTSD present peak elevations in clinical scales 8 (M = 97.53; CI 95% = [90.80; 104.26]) and 6 (M = 90.65; CI 95% = [81.70; 99.60]), followed by very high elevations in scales 2 (M = 87.65; CI 95% = [83.44; 91.86]), 7 (M = 85.31; CI 95% = [83.23; 87.38]), and 1 (M = 84.46; CI 95% = [78.34; 90.59]), high elevations in clinical scales 3 (M = 78.96; CI 95% = [76.96; 80.97]), 4 (M = 78.14; CI 95% = [71.76; 84.53]), and 0 (M = 74.37; CI 95% = [72.48; 76.26]), and moderate elevation in clinical scale 9 (M = 62.16; CI 95% = [54.47; 69.86]). Instead, in terms of the validity scales, peak elevations can

be noted in the F_B (M = 105.96; CI 95% = [100.49; 111.43]) and F scales (M = 105.18; CI 95% = [99.99; 110.36]), very high elevation in the F_P scale (M = 92.63; CI 95% = [86.72; 98.54]), mild elevation in the L scale (M = 51.62; CI 95% = [46.92; 56.33]), and low elevation in the K scale (M = 37.83; CI 95% = [35.53; 40.13]). Finally, as regards specific PTSD scales, very high elevation can be observed in the PK (M = 88.13; CI 95% = [83.45; 92.81]) and PS scales (M = 88.30; CI 95% = [83.49; 93.11]).

Risk of bias

The test results for funnel plot asymmetry for the meta-analysis of single means show that for nearly all the scales examined, there is good symmetry at the psychometric level. Only scales 3 (Hy; p = .07845) and 9 (Ma; p = .01354) could be at risk for publication bias.

DISCUSSION

The results of the analyses carried out suggest that the MMPI-2 is very useful is assessing the severity of PTSD symptoms. Exploring the association between MMPI-2 scores and PTSD symptoms, the peak elevation means of PTSD subject profiles in clinical scales 1 (Hs; *Hypochondriasis*), 2 (D; *Depression*), 6 (Pa; *Paranoia*), 7 (Pt; *Psychasthenia*), and 8 (Sc; *Schizophrenia*) can be observed as being consistent with previous research analysing this association. In fact, should one wish to attempt to describe the typical profile of a subject with PTSD by interpreting the peak elevations of such scales, there could be a concordance with the PTSD symptom clusters. Specifically, elevations in scale 1 (Hs) could reflect psychological reactivity, as well as the presence of general malaise and numerous vague somatic symptoms associated to an increase in symptoms of anxiety typical of PTSD. Elevations in clinical scale 2 (D) would reflect symptoms of depression, often reported by patients affected by PTSD. Indeed, people with elevated scores in this scale usually report weakness, fatigue, low energy; they often have trouble sleeping, a lack of interest in activities, tension; they are seen as being unhappy, pessimistic, and self-critical. Peak elevations in scale 6 (Pa) could be associated with aggression, acting out, hostility. People with elevated scores in this scale, in fact, are often hostile, resentful, argumentative; they are hypersensitive and hyperactive to the actions of others; they are often suspicious and defensive. Elevations, instead, in scale 7 (Pt) can be associated to symptoms of anxiety. People with elevations in these scales tend to be anxious, tense, agitated, and present a lack of concentration. Finally, peak elevations in scale 8 (Sc) can be associated to blunted affect, social alienation, and intrusive and/or dissociative symptoms, two clusters of PTSD symptomatology.

The meta-analyses, furthermore, confirm that specific PTSD scales, particularly the *PTSD-Keane* (PK) scale, are capable of optimally discriminating control subjects from subjects with PTSD. Elevated scores in these scales, in fact, indicate the presence of PTSD symptoms including anxiety, depression, emotional distress, disturbing thoughts, and trouble sleeping.

By analysing the validity scale scores, it can be seen that they are also in line with previous scientific literature. Indeed, they confirm the usefulness of the F family scales (F, F_B e F_P) in discriminating between subjects that actually have the disorder from those feigning/exaggerating the symptoms. Analysing all the validity scales as a whole, the trend is confirmed; that is, subjects with PTSD and fakers present peak elevations in the F scale and low scores in the L and K scales. Subjects with PTSD, in fact, have elevated scores in the F scale, typical of someone experiencing general distress who has had to face an excessive number of psychological problems. Fakers, on the other hand, paint a noticeably exaggerated picture in which they report an extreme number of symptoms that are more than likely not correlated to each other.

In general, from the individual network meta-analyses, the faker group scores for the validity scales are clearly higher than the group with PTSD.

Despite the fact that our analyses show a summary that generally confirms the existing literature, these results must be taken with caution. What was observed from the single means analyses is that even though the profiles of subjects with PTSD and faker subjects are significantly higher compared to the control subjects (indicating that the validity scales, clinical scales, and the two specific PTSD scales have good discriminating capacity), these profiles do not demonstrate good discriminating capacity among themselves. The graph of the profiles (see Fig. 5), indeed, shows that the only scales in which the confidence indexes do not overlap are the F family validity scales. This trend confirms the data in literature that attest to the difficulty in recognising fakers from those actually affected by PTSD due to the vast heterogeneity of

the symptomatology of the disorder itself and the traumatic events.

The results presented above are to be interpreted under certain limitations. First and foremost, all the measures used, with the exception of the PTSD diagnostic tools, are self-reporting tools, which could lead to bias in assessing the symptomatology of the disorder. Secondly, high sample heterogeneity could limit the reliability of the results. Moreover, there is a scarcity of combined studies and high heterogeneity in the diagnostic tools used.

CONCLUSIONS

The presented study is the first of its kind to analyse clinical scales and validity scales able to profile response styles typical of subjects with PTSD and fakers, useful in predicting subjects' vulnerability to PTSD. The results add to current literature assessing the relationship between MMPI-2 and PTSD symptomatology and confirm previous observations, that is, that clinical scales 1 (Hs), 2 (D), 6 (Pa), 7 (Pt), and 8 (Sc), the specific PTSD scales (PK and PS), and the validity scales (L, K, F, FB, FP) are able to discriminate subjects with PTSD from the general population. Furthermore, the usefulness of the F, F_B, and F_P validity scales has been confirmed in discriminating those feigning/exaggerating symptoms from those who actually experience symptoms typical of PTSD.

Implications for practice

An important practical implication of this work is having detected certain specific MMPI-2 clinical scales that tend to elevate in the presence of PTSD symptomatology. This can prove useful in clinical practice to predictively assess PTSD, administering the MMPI-2 longitudinally (for example, upon entry, immediately after a traumatic event) in order to identify which of the clinical scales found to be significant by our meta-analyses are closest to the T score of 65, the ideal level to discriminate the clinical groups from the normative sample of the MMPI-2 (Butcher et al., 1989). It may be advantageous to integrate this assessment with the administration of specific tools for PTSD and any correlated comorbidities, as well as tools capable of assessing the subject's personality structure. This makes it possible to define a profile that is both detailed and useful during the treatment plan.

A secondary reflection suggested by our work regards the possibility of analysing the general trend of validity scales rather than merely considering a single indicator of these scales. By doing so, in fact, the assessment of the subject's response style proves more accurate and allows fakers to be discriminated from those actually experiencing the symptoms of the disorder.

Moreover, given the vast variety of atypical response styles and presentations of "simulated" symptomology, clinics would not need to rely on a single measure and, therefore, a single tool; rather, they would need to use a series of tools and scales with the capacity to detect the various simulation strategies (Boone, 2009; Bush et al., 2005; Bush et al., 2014; Chafetz et al., 2015; Rogers, 2008; Rogers & Bender, 2018). To this end, there are various tools in literature to detect malingering. For example, Smith and Burger (1997) developed the *Structured Inventory of Malingered Symptomatology* (*SIMS*), a 75-item self-reporting tool designed to detect simulated psychopathological conditions and cognitive deficits, including psychosis, neurological disorders, and affective disorders (Widows & Smith, 2004). Moreover, a recent study by Giromini et al. (2019) demonstrated that the joint use of the MMPI-2 and *Inventory of Problems-29* (*IOP-29*; Viglione, Giromini & Landis, 2017) in assessing the credibility of depression-related symptoms can be a useful indicator of incremental validity as compared to exclusively using the MMPI-2 validity scales.

Implications for research

Future research might focus on the content and supplementary scales of the MMPI-2, helpful in defining more accurate PTSD profiles that also take into consideration any subtypes of the disorder and the various comorbidities. A further line of research might examine the use of restructured MMPI-2 clinical scales and evaluate whether they can discriminate PTSD symptomatology in the same way as clinical scales. Additionally, to more accurately discriminate malingering, research studies could be structured to enrol not only students as control subjects but also other subjects so as to examine their different scores and cut-offs. Finally, research models might be designed to associate the various items in the MMPI-2 with the PTSD symptom clusters, according to the DSM-5 diagnostic criteria.

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APPENDIX 1

Study quality analysis

Table A1-1 – Newcastle-Ottawa Quality Assessment Scale (adapted for cross-sectional studies)

Studies	Selection				Comparability		Outcome		Total Quality Score
Autor, year	Representativeness of the sample	Sample size	Non-respondents	Ascertainment of exposure	Study controls for the most important factor	Study controls for any addictional factor	Assessment of the outcome	Statistical test	
Albrecht et al. (1994)	*			**			*		4
Baldrachi et al. (1999)	*			**			*	*	5
Forbes et al. (1999)	*			**			*		4
Glenn et al. (2002)	*		*	**			*	*	6
Greenblatt & Davis (1999)	*			**			*	*	5
Munley et al. (1995)	*			**			*		4
Weyermann et al. (1996)	*			**			*		4

Table A1-2 – Newcastle-Ottawa Quality Assessment Scale

Studies	Selection				Comparability		Exposure			Total Quality Score
Autor, year	Case definition adequate	Representativeness of the cases	Selection of Controls	Definition of Controls	Study controls for the most important factor	Study controls for a second important factor	Ascertain-ment of exposure	Same method of ascertainment for cases and controls	Non-Response rate	
Arbisi & McNulty (2006)	*				*			*		3
Eakin et al. (2006)	*	*	*	*	*	*		*	*	8
Elhai et al. (2000)	*	*	*	*	*			*	*	7
Elhai et al. (2001)	*	*	*		*			*	*	6
Elhai et al. (2004)	*	*	*		*			*	*	6
Lange et al. (2010)			*		*			*		3
Lees-Haley (1992)			*		*			*		3
Litz et al. (2010)	*	*	*	*	*			*		6
Marshall et al. (2006)	*	*	*	*	*	*		*		7
Rademaker et al. (2009)	*			*	*			*		4
Scheibe et al. (2001)	*		*		*			*		4
Tolin et al. (2004)	*		*		*			*		4
Wetter et al. (1993)		*	*	*	*			*		5

APPENDIX 2

Participant characteristics

Table A2-1

Studies	Country	Experimental condition	Population	Gender	Age	Education (in years)	Marital status	War
Albrect et al. (1994)	USA	PTSD	47	M	42.6 (2.2)	13.2 (1.8)	–	Vietnam
Arbisi & McNulty (2006)	USA	PTSD	55	M	61.3 (14.8)	13.3 (3.3)	65.5% married 18.2% divorced 5.5% widowed 9.1% single	38.2% WWII 36.4% Vietnam 7.3% Korea 3.6% Gulf
	USA	Fakers	35	M	57.7 (15.2)	13.4 (2.9)	64.7% married 20.6% divorced 11.8% single 2.9% widowed	26.5% WWII 32.4% Vietnam 8.8% Korea 17.6% Gulf
Baldrachi et al. (1999)	USA	PTSD	36	M	45 (3.7)	12.1 (2.2)	18 married 15 divorced 1 single 2 not classified	Vietnam
Eakin et al. (2006)	USA	PTSD, Control, Fakers	85	M = 26 F = 59	19 (1.2)	80% first or second year of university	96 unmarried	–
Elhai et al. (2000)	USA	PTSD	124	M	45.71 (6.54)	12.28 (2.71)	8 single 62 married 30 previously married	2 WWI 4 Korea 92 Vietnam 2 Gulf
	USA	Fakers	84	M = 27 F = 57	29.77 (9.81)	13.57 (1.81)	55 single 39 married 6 previously married	–

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Studies	Country	Experimental condition	Population	Gender	Age	Education (in years)	Marital status	War
Elhai et al. (2001)	USA	CSA PTSD	64	M = 9 F = 55	31.21 (8.73)	12.21 (2.03)	37 single 35 married, in a relationship, or cohabitating 27 divorced or widowed	–
	USA	Fakers	85	M = 25 F = 58	29.67 (9.80)	13.56 (1.83)	38 single 56 married, in a relationship, or cohabitating 6 divorced or widowed	–
Elhai et al. (2004)	USA	CSA PTSD	41	M = 3 F = 38	33.7 (10.3)	12.5 (2.4)	60% single 20% married 20% divorced	–
	USA	Fakers	39	M = 19 F = 20	19.5 (3.1)	95% first, second, or third year of university	–	–
Forbes et al. (1999)	Australia	PTSD	100	M	49 (2.6)	–	59% married	Vietnam
Gleen et al. (2002)	USA	PTSD	134	M	47.7 (3.8)	12.7 (2.0)	–	Vietnam
	USA	PTSD	38	M	32.1 (7.6)	13.3 (1.6)	–	Gulf
Greenblatt & Davis (1999)	USA	PTSD	27	M	44.4 (12.0)[a]	12.8 (2.1)[a]	–	Not specified
Lange et al. (2010)	Australia	Fakers Control	15 20	95% F	22.7 (8.2)	–	–	–
Lees-Haley (1992)	USA	Fakers	55	M = 32 F = 23	38.9 (10.0)	–	–	–
	USA	Control	64	M = 27 F = 37	39.1 (11.3)	–	–	–

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Studies	Country	Experimental condition	Population	Gender	Age	Education (in years)	Marital status	War
Litz et al. (1991)	USA	PTSD	29	M	43.4 (2.6)	12.8 (2.1)	–	Vietnam
	USA	Control	32	M = 21 F = 11	34.4 (9.9)	–	–	–
Marshall et al. (2006)	Canada	PTSD	186	M = 137 F = 49	40.54 (9.15)[b]	–	–	–
	Canada	Control	73	–	–	–	–	–
	Canada	Fakers	67	M = 43 F = 24	22.53 (5.8)[b]	–	–	–
Munley et al. (1995)	USA	PTSD	27	M	44	11.65	–	Not specified
Rademaker et al. (2009)	Germany	PTSD	90	M	35 (7.0)	–	–	34 Lebanon 40 Yugoslavia 16 Angola, Iraq, and Cambodia
	Germany	Control	30	M	35 (8.7)	–	–	–
Scheibe et al. (2001)	Canada	PTSD	25	M	39.08 (10.62)[c]	–	–	–
		Control	21	M				
Tolin et al. (2004)	USA	PTSD	295	M	47.3 (9.0)	–	–	341 during Vietnam 54 before Vietnam 28 after Vietnam
	USA	Control	128	M		–	–	
Weyermann et al. (1996)	USA	PTSD	31	M	45 (2.76) d	–	–	Vietnam
Wetter et al. (1993)	USA	PTSD	20	M = 14 F = 6	39.4 (7.1)	12.9 (2.0)	–	Not specified
	USA	Fakers	20	M = 8 F = 12	34.8 (7.5)	11.8 (0.6)		–

[a] Mean and Standard Deviation referring to a total sample of 102 subjects, of whom 18 were diagnosed with schizophrenia, 57 with depression, and 27 with PTSD.

[b] Mean and Standard Deviation referring to the general patient sample of 199 subjects and university students of 77, before exclusion.

[c] Mean and Standard Deviation referring to the general patient sample of 54 subjects, before exclusion.

[d] Mean and Standard Deviation referring to a total sample of 88 subjects.

Table A2-2

Studies	Experimental condition	Sample specifications
Albrect et al. (1994)	P3TSD	Sample with only PTSD diagnoses
Arbisi & McNulty (2006)	PTSD	Sample with only PTSD diagnoses
	Fakers	Veterans coached to exaggerate PTSD symptoms. Of these, 67% made use of PTSD-related treatment services and only 6.7% for other types of medical or psychological conditions
Baldrachi et al. (1999)	PTSD	Sample with only PTSD diagnoses
Eakin et al. (2006)	PTSD	Sample with only PTSD diagnoses
	Control	University students. In order to be included in the control group or in the "experimental fakers", they were required to have experienced symptoms typical of PTSD diagnosis Criteria A and have low PCL scores (no possible PTSD)
	Fakers	
Elhai et al. (2000)	PTSD	Sample with only PTSD diagnoses
	Fakers	Non-clinical university students coached to exaggerate PTSD symptoms
Elhai et al. (2001)	CSA PTSD	Sample with only PTSD diagnoses
	Fakers	Non-clinical university students coached to exaggerate PTSD symptoms
Elhai et al. (2004)	CSA PTSD	Sample with only PTSD diagnoses
	Fakers	Non-clinical university students coached to exaggerate PTSD symptoms
Forbes et al. (1999)	PTSD	Sample with only PTSD diagnoses
Gleen et al. (2002)	PTSD	Sample with only PTSD diagnoses
	PTSD	Sample with only PTSD diagnoses
Greenblatt & Davis (1999)	PTSD	Sample with only PTSD diagnoses
Lange et al. (2010)	Fakers	Non-clinical university students coached to exaggerate PTSD symptoms
	Control	Non-clinical university students
Lees-Haley (1992)	Fakers	Patients who reported psychological suffering but that such suffering could not be equated to PTSD Criteria A but who scored T=65 in the PK and PS scales
	Control	Patients seeking compensation for psychological injuries sustained with low scores in the PK and PS scales

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Studies	Experimental condition	Sample specifications
Litz et al. (1991)	PTSD	Sample with only PTSD diagnoses
	Control	Non-clinical sample
Marshall et al. (2006)	PTSD	Sample with only PTSD diagnoses
	Control	Non-clinical sample
	Fakers	Non-clinical university students coached to exaggerate PTSD symptoms
Munley et al. (1995)	PTSD	Sample with only PTSD diagnoses
Rademaker et al. (2009)	PTSD	Sample with only PTSD diagnoses
	Control	Non-clinical sample
Scheibe et al. (2001)	PTSD	Patients with PTSD, of whom 19 (68%) with various comorbidities: 12 (64%) diagnosed with major depression, 4 (21%) with an anxiety disorder other than PTSD, and 3 (18%) with panic attacks
	Control	Patients without PTSD of whom 8 (36%) have not been diagnosed with any disorders, 7 (32%) diagnosed with major depression, 3 (14%) with an anxiety disorder other than PTSD, 4 (18%) with panic attacks, and 3 (14%) with adjustment disorders
Tolin et al. (2004)	PTSD	Veterans with PTSD with various comorbidities: 48% with a depressive disorder, 23% with one or more anxiety disorders other than PTSD
	Control	Veterans without PTSD, of whom 28% with a depressive disorder, 16% with one or more anxiety disorders other than PTSD
Weyermann et al. (1996)	PTSD	Veterans, of whom 31 diagnosed solely with PTSD, 33 diagnosed with PTSD and a mood disorder, 8 diagnosed with PTSD and other anxiety disorders, and 16 diagnosed with PTSD, anxiety and mood disorders
Wetter et al. (1993)	PTSD	Sample with only PTSD diagnoses
	Fakers	Non-clinical sample coached to exaggerate PTSD symptoms