

# Psychometric properties of the Copenhagen Burnout Inventory (CBI) in Italian Physicians

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**KEY WORDS:** Copenhagen burnout inventory; burnout; physician; psychometrics

## ABSTRACT

**Background:** *This study aimed to standardize the Copenhagen Burnout Inventory (CBI), a psychometrically sound, worldwide-spread tool among Italian physicians. Methods:* Nine hundred and fifteen Italian physicians were web-administered the CBI, Patient Health Questionnaire-8 (PHQ-8), Generalized Anxiety Disorder-7 (GAD-7) and General Self-Efficacy Scale (GSE). The present CBI included 18 items (range=19-90) assessing Personal, Work-related and Client-related Burnout. Client-related adaptation was performed. Construct validity, factorial structure (Confirmatory Factor Analysis) and internal consistency were tested. Diagnostic accuracy was assessed simultaneously against the PHQ-8, GAD-7 and GSE. All CBI measures yielded optimal internal consistency (Cronbach's  $\alpha$ =0.90-0.96). **Results:** The CBI met its original three-factor model (CFI=0.94; TLI=0.93; RMSEA=0.09; SRMR=0.04), was positively related to the PHQ-8 ( $r=0.76$ ) and GAD-7 ( $r=0.73$ ), whereas negatively with the GSE ( $r=0.39$ ) and yielded optimal diagnostics (AUC=0.93; sensitivity=0.91 and specificity=0.85 at the optimal cutoff of 69/90). **Conclusion:** The CBI is thus a valid, reliable, and normed tool to assess burnout levels in physicians.

## 1. INTRODUCTION

Burnout syndrome is traditionally defined as a psychological reaction to chronic work-related stress characterized by three dimensions: (i) energy depletion, or exhaustion, (ii) increased mental distance from one's job or feelings of negativism or cynicism related to one's job, and (iii) reduced professional efficacy [1]. This syndrome impacts employees' well-being, causing physical weakness, insomnia, anxiety, depression,

and on institutions and systems through expensive job turnover and increased decisional errors, absenteeism, and poor work performance [1].

It is, therefore, necessary to detect such a syndrome early through ad-hoc psychometric tools to aid preventive interventions. In this respect, The Maslach Burnout Inventory (MBI) [2] has been thoroughly adopted worldwide, but despite adequate psychometric support, its content validity has been questioned [1]. In addition, as being

Received 13.05.2022 - Accepted 28.07.2022

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copyrighted, the MBI requires organizations to invest large amounts of economic resources.

In such a framework, Kristensen et al. [3] developed the Copenhagen Burnout Inventory (CBI), a free-to-use tool that extends the construct of burnout syndrome to different domains of workers' life, such as assessing personal, work-, and client-related burnout. Within the CBI, personal burnout is operationalized in terms of feelings of physical, emotional, and cognitive fatigue and exhaustion. In contrast, work-related burnout refers to symptoms that respondents attribute to their specific work activity. Client-related burnout instead taps on burnout symptoms selectively referring to respondents' feelings towards their target clients (e.g., students for teachers, patients for physicians, etc.).

The CBI has recently been standardized in many countries across a wide variety of settings and samples, such as nurses and physicians [4], pharmacists [5], professors [6], medical students [7], and health-care employees [8], showing good psychometric properties for measuring occupational burnout. Despite this, in Italy, the tool was only validated among teachers [6]. However, given its high flexibility in target populations, standardizations in other samples have been encouraged by the original authors [3].

Physicians have been historically identified as particularly at-risk for burnout and would thus benefit from such an ad hoc standardization study. The latter assertion acquires even greater relevance in the face of the COVID-19 pandemic, which, albeit overall increased the prevalence and incidence of burnout in several occupational settings, undoubtedly poses major pressure, especially on healthcare systems and thus physicians [9]. The pandemic has indeed entered novel stressors possibly contributing to physician burnout: fears of becoming infected or infecting a family member, a lack of appropriate personal protective equipment, impossibility to access up-to-date information, restricted time with close ones, economic revenue reductions, and increased demands from family responsibilities [10].

As physician burnout can adversely affect their mental and physical health and, in turn, decrease the quality of care, it is crucial to assess their burnout levels through psychometric tools specifically standardized in this population. This research thus

aims to provide psychometric properties of the CBI among Italian physicians. It should be noted that the validation of a tool is limited to assessing its internal validity, i.e. the consistency among items and their reproducibility.

## 2. METHODS

### 2.1. Participants

Twelve hundred and four responses to a web-based questionnaire (Google Form) sent by ANAAO ASSOMED Lombardia Associazione Dirigenti Medici (Milan, Northern Italy) were obtained between November 2021 and January 2022. Only physicians delivering medical care to the patient were included in the final sample ( $N=915$ ; 505 females, 410 males; median age class: 41–50 years; median years of service class: 16–25 years). They were almost all (94.3%) permanent staff members whose demographic and occupational characteristics are reported in Table 1.

### 2.2. Materials

The Italian CBI by Avanzi et al. [6] is a self-report questionnaire including 19 Likert-like items ranging from 1 (“Never/almost never” for items 1–12 or “To a very low degree” for items 13–19) to 5 (“Always” for items 1–12 or “To a very high degree” for items 13–19); its total score ranges from 19 to 95 (high values corresponding to high burnout levels). Items 1–6 assess Personal Burnout (PB), items 7–10 and 13–15 Work-related Burnout (WB) and items 11–12 and 16–19 Client-related Burnout (CB). For this study, the Italian CBI was adapted as follows: (i) items were re-worded by referring to “patients” instead of “students”; (ii) item 17 (“Do you find it frustrating to work with clients?”) was dropped as in contrast with physicians' deontological principles and thus likely to induce social desirability-biased responses. Hence, the present CBI included 18 items and ranges from 18 to 90. Depression and anxiety were assessed via the Patient Health Questionnaire-8 (PHQ-8) [11] and Generalized Anxiety Disorder-7 (GAD-7) [12], respectively, whereas self-efficacy via the General Self-Efficacy Scale (GSE) [13].

**Table 1.** Participants' demographic and occupational characteristics.

Measures ( <i>N</i> =915)	Percentage
<b>Sex</b>	
Male	44.8%
Female	55.2%
<b>Age</b>	
<30	0.9%
31-40	24.8%
41-50	30.2%
51-60	28.4%
>60	15.7%
<b>Years of service</b>	
<5	6.6%
5-15	35.4%
16-25	26.6%
>25	31.5%
<b>Department</b>	
Clinical immunology	0.3%
Anesthesiology and resuscitation	11.6%
Audiology and phoniatrics	0.1%
Cardiac surgery	0.8%
Cardiology	7.1%
Child neuropsychiatry	2.4%
Clinical pharmacology and toxicology	0.2%
Dermatology and venereology	0.7%
Respiratory system diseases	2.7%
Emergency medicine	2.4%
Endocrinology	1.5%
Dietetics	0.5%
Forensic medicine	0.2%
Gastroenterology	1.6%
General surgery	7.8%
Geriatrics	1.6%
Gynaecology and obstetrics	5.5%
Haematology	1.3%
Public health and epidemiology	0.2%
Infectious diseases	3.4%
Internal medicine	9.5%
Maxillofacial surgery	0.5%

Measures ( <i>N</i> =915)	Percentage
Medical genetics	0.1%
Metabolic diseases	0.2%
Microbiology and virology	0.1%
Neonatology	0.8%
Nephrology	2.8%
Neurology	2.8%
Neurosurgery	1.1%
Nuclear medicine	0.1%
Occupational medicine	1.1%
Oncology	2.6%
Ophthalmology	1.3%
Orthopaedics and traumatology	4.3%
Otolaryngology	1.3%
Pediatric surgery	1.0%
Paediatrics	3.1%
Physical medicine and rehabilitation	1.5%
Plastic and reconstructive surgery	0.2%
Psychiatry and clinical psychology	5.1%
Radiodiagnostics	0.5%
Radiotherapy	0.4%
Rheumatology	0.9%
Thoracic surgery	0.3%
Transfusion medicine	0.8%
Urology	2.2%
Vascular surgery	1.2%
Other	1.7%

### 2.3. Statistics

As skewness and kurtosis values were  $\leq |1|$  and  $\leq |3|$ , respectively, for all raw psychometric measures, normality and homoscedasticity were assumed as met, and associations of interest were thus tested via Pearson's coefficients.

Internal consistency was assessed with Cronbach's  $\alpha$ . The factorial structure was evaluated by Confirmatory Factor Analysis (CFA) by addressing the following metrics: root mean the square error of approximation (RMSEA), standardized root mean square residual (SRMR), Tucker-Lewis index (TLI), comparative fit index (CFI). Model fit was

judged acceptable according to the following cut-offs [14]: RMSEA $\leq$ 0.1; SRMR $\leq$ .08; TLI and CFI  $\geq$ 0.9.

Diagnostic accuracy of the CBI was tested through receiver-operating characteristics analyses against a state variable defined as the co-occurrence of a PHQ-8 and GAD-7 scores  $\geq$ 10 (moderate depression and anxiety, respectively) [11, 12] and a GSE score below the 5<sup>th</sup> percentile ( $\leq$ 20). Youden's J statistics identified the optimal cutoff, which maximizes sensitivity and specificity ( $J=1-Se+Sp$ ).

In all the analyses, item 10 was reversed. Multiple comparisons were Bonferroni-corrected when necessary. Analyses were run via SPSS 27 (IBM Corp., 2021) and JASP 0.16.1 (JASP Team, 2022).

### 3. RESULTS

Psychometric measures are summarized in Table 2.

The CFA (Figure 1) revealed an optimal fit to the three-factor model (CFI=0.94; TLI=0.93; RMSEA=0.09; SRMR=0.04), with all items significantly loading ( $ps<0.001$ ) on each CBI subscale (PB: loading range=0.67-1.02; WB: loading range=0.59-1.03; CB: loading range=0.7-1.02). Cronbach's  $\alpha$  was excellent for all CBI measures (Total: 0.96; PB: 0.92; WB: 0.91; CB: 0.9), with optimal item-total correlations (Total: 0.51-0.84; PB: 0.74-0.88; WB: 0.59-0.83; CB: 0.56-0.83).

At  $\alpha_{adjusted}=0.017$ , CBI scores were positively related with the PHQ-8 ( $r(915)=0.76$ ;  $p<0.001$ ) and GAD-7 ( $r(915)=0.73$ ;  $p<0.001$ ), whereas negatively with the GSE ( $r(915)=-0.39$ ;  $p<0.001$ ).

The CBI yielded optimal diagnostic accuracy (AUC=0.93; SE=0.02; CI 95% [0.89, 0.96]) and, at its optimal cutoff ( $>69/90$ ;  $J=0.76$ ), high sensitivity (0.91) and specificity (0.85). At this cutoff, 16.9% of the sample resulted as presenting with a burnout syndrome.

### 4. DISCUSSION

The present study provides Italian practitioners and researchers with evidence on the psychometric goodness of the CBI as addressed to physicians. The CBI met the three-factor factorial structure

**Table 2.** Participants' psychometric measures.

CBI	Scores, mean +/- SD (range)
Total	54.74 $\pm$ 15.19 (19-90)
PB	18.63 $\pm$ 5.47 (6-30)
WB	21.76 $\pm$ 6.36 (7-35)
UB	14.35 $\pm$ 4.85 (5-25)
CBI-1	3.63 $\pm$ .86 (1-5)
CBI-2	3.16 $\pm$ 1.02 (1-5)
CBI-3	3.20 $\pm$ 1.06 (1-5)
CBI-4	3.21 $\pm$ 1.20 (1-5)
CBI-5	2.97 $\pm$ 1.16 (1-5)
CBI-6	2.46 $\pm$ 1.08 (1-5)
CBI-7	3.47 $\pm$ 1.05 (1-5)
CBI-8	2.85 $\pm$ 1.19 (1-5)
CBI-9	2.72 $\pm$ 1.18 (1-5)
CBI-10*	3.08 $\pm$ 1.07 (1-5)
CBI-11	2.68 $\pm$ 1.17 (1-5)
CBI-12	2.98 $\pm$ 1.24 (1-5)
CBI-13	3.72 $\pm$ 0.96 (1-5)
CBI-14	3.06 $\pm$ 1.19 (1-5)
CBI-15	2.84 $\pm$ 1.23 (1-5)
CBI-16	2.62 $\pm$ 1.09 (1-5)
CBI-18	2.86 $\pm$ 1.08 (1-5)
CBI-19	3.21 $\pm$ 1.18 (1-5)
<b>PHQ-8</b>	8.79 $\pm$ 5.26 (0-24)
<b>GAD-7</b>	8.15 $\pm$ 5.06 (0-21)
<b>GSE</b>	28.44 $\pm$ 4.25 (10-40)

\*Reversed scale item. CBI = Copenhagen Burnout Inventory; PB = Personal Burnout; WB = Work-related Burnout; CB = Client-related Burnout; PHQ-8 = Patient Health Questionnaire-8; GAD-7 = General Anxiety Disorder-7; GSE = General Self-Efficacy Scale.

originally identified (PB, WB and CB [3]), and all its measures yielded high internal consistency. Moreover, higher CBI scores were found to be strongly related to higher depression (PHQ-8) and anxiety (GAD-7) levels, as well as moderately with lower self-efficacy (GSE) levels. The latter

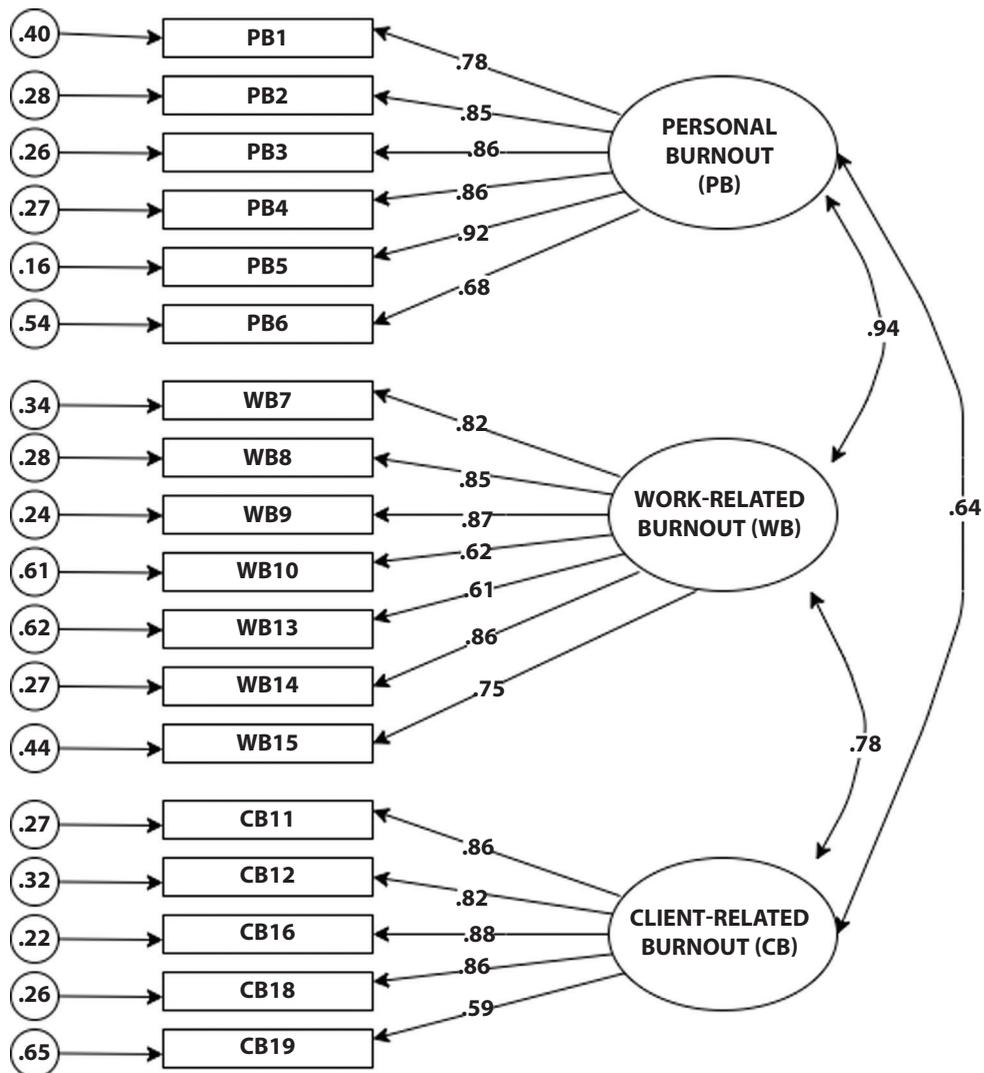


Figure 1. CFA for the CBI in Italian physicians.

findings partially support its both convergent and divergent validity, filling the gaps related to previous CBI standardization, which under-addressed such a fundamental psychometric property [4]. However, additional research is needed to confirm the convergent validity of the CBI against a proper burnout scale (e.g., the MBI).

It should be noted that the high correlation among factors is in line with previous studies addressing the multi-dimensional burnout scale [15]. It should also be noted that physicians included in the present work came from different types of healthcare organizations (i.e., public, private, and academic medical

centers), thus supporting the external validity of these findings and thus the usability of the CBI in physicians regardless of their specific extraction.

This work also provides a cutoff value derived from an empirical algorithm addressing high levels of depression and anxiety and, simultaneously, low levels of self-efficacy, which is both theoretically motivated and supported by the abovementioned data on construct validity. Accordingly, scores on the CBI above 69/90 are to be addressed as suggestive of a burnout syndrome and would thus motivate clinical attention. In this respect, the excellent intrinsic diagnostics detected for the CBI at such

a cutoff strongly support its clinical use in the prevention setting for the early detection of burnout syndrome in physicians.

As to limitations, it should be noted that data collection occurred during an ongoing wave of COVID-19 (November 2021-January 2022); hence, greater levels of burnout might have yielded due to such a contingency. However, in this last respect, as expected that the pandemic will represent a “chronic” burden on healthcare professionals in the future, the present findings are likely to be likewise representative of the actual status quo of burnout syndrome in Italian physicians. The present CBI represents a further limitation depletes item 17; this may limit the comparability of the current findings with those yielded from the administration of the original CBI by Avanzi et al. [6]. However, the removal of such an item has been deemed adequate for the aims of the present study, since physicians are not supposed to find it frustrating to work with patients, according to their deontological code. Hence, maintaining such an item would have implied to receive responses biased by social desirability. Future research should investigate the measurement invariance of the CBI across representative samples from different Countries and based on demographic confounders, i.e., aimed at assessing its external validity [4].

## 5. CONCLUSIONS

The CBI is a valid, reliable, and normed tool to assess burnout levels in physicians for both clinical and research purposes. The good psychometric properties of the CBI herewith reported are consistent with prior research [4, 7]. The CBI is thus suitable for every healthcare organization to obtain information that could help guide preventive interventions, also considering its short-lived nature and ease of use.

**FUNDING:** The present research received funding from ANAAO ASSOMED Lombardia Associazione Medici Dirigenti. Research partially funded by the Italian Ministry of Health to N.B.

**INSTITUTIONAL REVIEW BOARD STATEMENT:** Participants provided informed consent. This study was approved by the Ethics Committee of the University of Milano-Bicocca (RM-2021-451).

**INFORMED CONSENT STATEMENT:** Informed consent was obtained from all subjects involved in the study.

**ACKNOWLEDGMENTS:** The Authors would like to thank Prof. Tage S. Kristensen and Prof. Lorenzo Avanzi for allowing us to adopt the CBI and related materials for the purposes of this study.

**DECLARATION OF INTEREST:** The authors declare no conflict of interest.

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