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Monitoring stress among internal medicine residents: an experience-driven, practical and short measure

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ABSTRACT

Residents experience severely high levels of stress, depression and burnout, leading to perceived medical errors, as well as to symptoms of impairment, such as chronic anger, cognitive impairment, suicidal behavior and substance abuse. Because research has not yet provided a psychometrically robust population-specific tool to measure the level of stress of medicine residents, we aimed at building and validating such a measure. Using an inductive scale development approach, a short, pragmatic measure was built, based on the interviews of 17 medicine residents. The Internal Medicine Residency Stress Scale (IMRSS) was then administered in a sample of 259 internal medicine residents (199 females, 60 males, $M_{Age} = 25.6$) along with the Hospital Anxiety and Depression Scale, Maslach Burnout Inventory, Satisfaction With Life Scale and Ways of Coping Checklist. The IMRSS showed satisfactory internal reliability (Cronbach's $\alpha = .86$), adequate structural validity – studied through Confirmatory Factor Analysis ($\chi^2/df = 2.51$, CFI = .94; SRMR = .037, RMSEA = .076) – and good criterion validity – the IMRSS was notably strongly correlated with emotional exhaustion ($r = .64$; $p < .001$) and anxiety ($r = .57$; $p < .001$). Because of its short length and robust psychometric qualities, the use of the IMRSS is recommended to quickly and frequently assess and monitor stress among internal medicine residents.

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Introduction

Medicine residents are abundantly described as experiencing severely high levels of stress (Levey, 2001), depression (Daskivich et al., 2015) and burnout (Campbell, Prochazka, Yamashita, & Gopal, 2010). New residents, after a phase of anticipation and excitement, start facing a dangerous combination of work overload, self-doubt and patient care responsibility, without being always sufficiently prepared for it (Levey, 2001). The resulting stress often leads to medical errors (West, Tan, Habermann, Sloan, & Shanafelt, 2009) and symptoms of impairment, such as chronic anger, cognitive impairment, depression, suicidal behavior

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and substance abuse (Levey, 2001). Furthermore, the very role played by medical residents makes their psychosocial well-being not only a matter of their own present and future health, but also a matter of the quality of patient care: The stress experienced by medicine residents has notably been found to lead to perceived medical errors (West et al., 2009).

Assessing levels of stress among residents may be a way to estimate the severity of a resident's stress level and to identify its sources, and consequently trigger, advocate for, or contribute to a form of intervention (Levey, 2001). Moreover, the very use of well-being measures among residents could increase their self-awareness (O'Rourke, Hammond, O'Flynn, & Boylan, 2010) and activate helpful and cathartic discussions on stress, coping strategies and vulnerabilities, consequently partly preventing stress symptoms (Levey, 2001).

Although the Medical Student Stress Profile (O'Rourke et al., 2010) provides a robust measure of stress among medical students, it is a wide-ranging inventory that primarily focuses on studentship and it specificities. While helpful to extensively assess student well-being, it is is less helpful to quickly assess stress in a residency context: Students have occupational stress factors that are very related to school activities (examinations, course organization, poor lecturers, finding an internship, etc.), while residents have more practice-related preoccupations (responsibility for patient well-beings, difficult patients, etc.).

Addressing the need for a brief and specific measure, we aimed building a psychometrically robust, specific, experience-driven and brief instrument to assess the level of stress of internal medicine residents.

Method

Participants

259 volunteer French internal medicine residents (M_{Age} = 25.6, 199 females, 60 males) completed questionnaires during their first semester as residents.

Procedure

The participants were recruited at their hospitals, and the administration was conducted online, with guaranteed confidentiality. The participants were presented the research as a study of their quality of life and psychosocial health.

Materials

Internal Medicine Residency Stress Scale

The Internal Medicine Residency Stress Scale (IMRSS) is a population-specific measure of stress, which aims at measuring the level of stress of internal medicine residents. The questionnaire was constructed through an inductive process, using internal medicine residents as Subject Matter Experts (SMEs; Kline, 2005). The researchers independently interviewed the SMEs to identify the primary sources of stress among residents. The process continued until thematic saturation, which occurred after the interview of 17 SMEs – to avoid biasing the results, the 17 SMEs did not participate in the rest of the study. In line with previous research (Buddeberg-Fischer, Klaghofer, Stamm, Siegrist, & Buddeberg, 2008; Saini, Agrawal, Bhasin, Bhatia, & Sharma, 2010), the interviews indicated that the residents' stress

had two major sources: Work overload and medical accountability. Indeed, the residents were mainly concerned with (1) having a heavy workload – causing unhealthy work-life balance, sleep deprivation, etc. – and (2) facing high patient care responsibility with a feeling of incompetence and experience. Consequently, a bidimensional measure (reported in Appendix 1) was built, which aimed at measuring Work Overload (WO), and Medical Accountability (MA).

External criteria

We used as criteria (1) the French validated translation (Bocéréan & Dupret, 2014) of the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983), a widely recommended (Cosco, Doyle, Ward, & McGee, 2012) anxiety and depression measure; (2) the French validated translation (Dion & Tessier, 1994) of the Maslach Burnout Inventory (MBI; Maslach & Jackson, 1981), a measure of emotional exhaustion, depersonalization and inefficacy, widely used among practitioners (Gopal, Glasheen, Miyoshi, & Prochazka, 2005); (3) the French validated translation (Blais, Vallerand, Pelletier, & Brière, 1989) of the Satisfaction With Life Scale (SWLS; Pavot & Diener, 1993), which measures measuring one's judgment of life satisfaction; and (4) the French validated translation (Cousson-Gelie et al., 2010) of the Ways of Coping Checklist-Revised (WCC-R; Vitaliano, Russo, Carr, Maiuro, & Becker, 1985), which measures preferred coping strategies among problem-focused strategies, emotion-based strategies and social support seeking.

Data analyses

The scale and subscale score reliability was investigated using Cronbach's α. We studied the factor structure of the IMRSS by conducting Confirmatory Factor Analyses (CFA), using the R-package '*lavaan*' (Rosseel, 2012). Because some item score distributions were moderately skewed, we used the recommended (Hoyle, 2014) Robust Maximum Likelihood estimation (Satorra & Bentler, 1994), to obtain more accurate model fit indices. A theoretical two-correlated factors model was tested, and, as it is classically done in similar structural investigations (i.e. Myszkowski, Storme, Zenasni, & Lubart, 2014; Storme, Myszkowski, Davila, & Bournois, 2015), a unidimensional and a two-orthogonal factors model were tested. Finally, we investigated criterion validity by examining the bivariate correlation coefficients between the IMRSS and the external criteria.

Results

Univariate analyses

The univariate statistics the different scales are reported in Table 1.

Age and gender differences

Age was not significantly correlated with the IMRSS (r = .07; p < .28). As previously found (Levey, 2001), women (M = 32.5; SD = 6.3) had significantly higher IMRSS scores ($t(257)$ = 2.51; p < .05) than men (M = 30.0; SD = 8.3).

Table 1. Descriptive statistics and scale score reliability.

Scale/subscale	Mean	SD	Median	Minimum	Maximum	Cronbach's *α*
IMRSS – Total	32.0	6.9	33	9	45	.86
IMRSS – Work Overload	16.4	4.8	17	4	25	.86
IMRSS – Medical Accountability	15.6	3.1	16	4	20	.78
SWLS – Satisfaction With Life	25.0	6.4	26	8	35	.89
HADS – Anxiety	7.8	3.8	7	1	20	.78
HADS – Depression	4.0	3.1	3	0	18	.77
WCC – Emotion-focused coping	21.5	6.2	22	9	36	.87
WCC – Problem-focused coping	27	5.1	27	10	40	.82
WCC – Seeking social support	21.6	4.5	22	8	32	.73
MBI – Emotional exhaustion	24.6	11.7	24	0	53	.91
MBI – Depersonalization	12.5	6.5	12	0	30	.76
MBI – Inefficacy	35.8	7.1	37	8	48	.83

Table 2. Fit indices of the IMRSS.

Scale (model)	χ^2	*df*	χ^2/df	CFI	SRMR	RMSEA	AIC
Theoretical 2-correlated factors model	65.4	26	2.51	.944	.037	.076	6140.0
2-Independent factors model	130.0	27	4.81	.852	.196	.122	6210.0
1-Factor model	193.0	27	7.14	.763	.092	.154	6290.0

Notes: CFI – Comparative Fit Index; SRMR – Standardized Root Mean Square Residual; RMSEA – Root Mean Square Error of Approximation; AIC – Akaike Information Criterion.

Scale score reliability

The Cronbach's α – also reported in Table 1 – indicate that the IMRSS-WO, IMRSS-MA and IMRSS total score had good scale score reliability. No item was found to lower the α of any of the IMRSS scores.

Factor structure

The fit indices of the tested models are reported in Table 2. The observed fit indices suggest that the theoretical model – presented in Figure 1 – has adequate fit (Hu & Bentler, 1999). The theoretical two-correlated factors model had a better fit than the alternate models, which both had mediocre fit.

Criterion validity

The correlations between the different scales are reported in Table 3.

Discussion

In spite of its length, the IMRSS has shown appropriate scale score reliability. Additionally, the theoretical structure was supported, and fit the data better than the two alternate models. Finally, the correlations observed between the IMRSS and the validity criteria were consistent with previous findings (Dahlin, Joneborg, & Runeson, 2005), suggesting that the IMRSS has good criterion validity.

Individuals who reported low satisfaction with life, high anxiety and high depression high levels of stress. Furthermore, a positive strong correlation was found between the

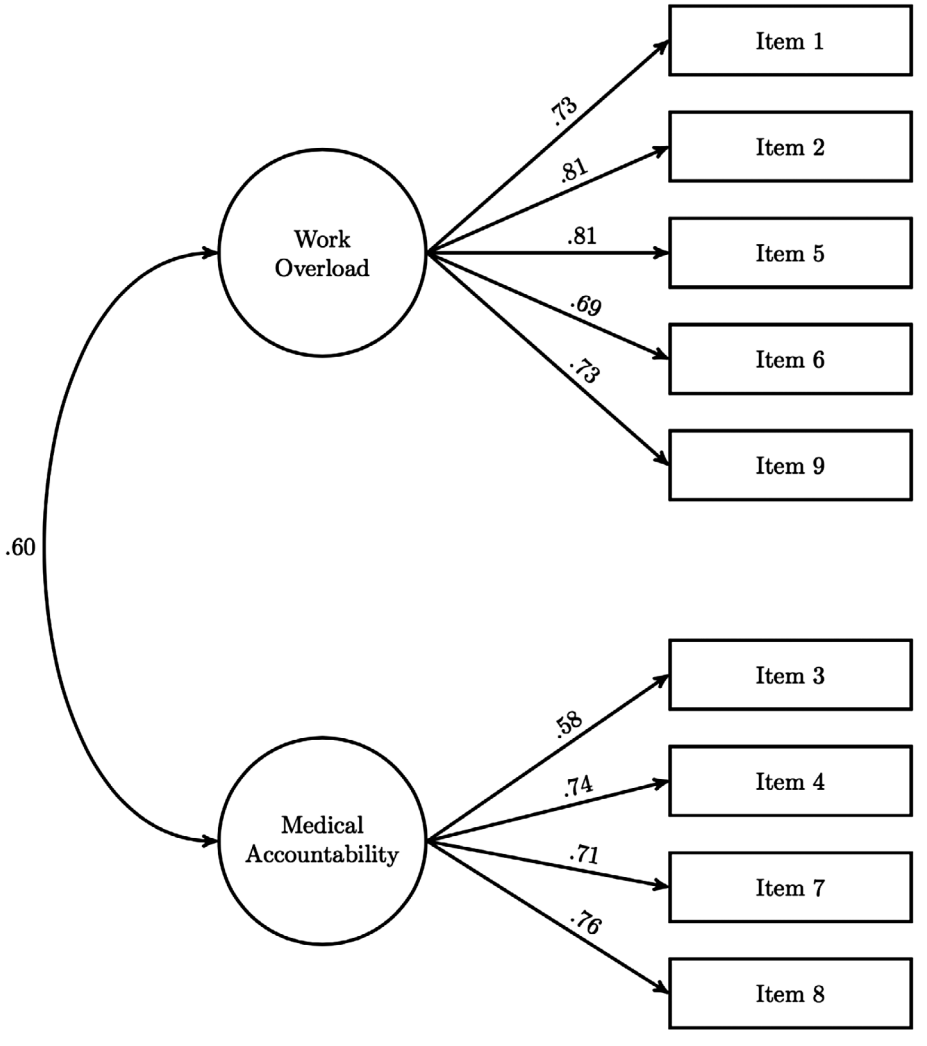

Figure 1. Path diagram of the 2 correlated factors model with standardized coefficient estimates.

Table 3. Correlation coefficients between the various measures.

	IMRSS	IMRSS-WO	IMRSS-MA
IMRSS – Total	/	/	/
IMRSS – Work Overload	.92***	/	/
IMRSS – Medical Accountability	.80***	.50***	/
SWLS – Satisfaction With Life	−.36***	−.35***	−.25***
HADS – Anxiety	.57***	.52***	.46***
HADS – Depression	.46***	.46***	.30***
WCC – Emotion-focused coping	.53***	.44***	.49***
WCC – Problem-focused coping	.09	.09	.07
WCC – Social support	.27***	.19**	.30***
MBI – Emotional exhaustion	.64***	.63***	.45***
MBI – Depersonalization	.35***	.31***	.30***
MBI – Inefficacy	−.11	−.14*	−.03

***$p < .001$; **$p < .01$; *$p < .05$.

IMRSS, and both emotion-focused coping and seeking for social support. This pattern of results could indicate that higher levels of stress tend to trigger more emotion-focused and social support coping strategies among residents, or that such coping strategies do not efficiently help residents reduce their stress. Oppositely, the results indicate that the IMRSS was not related to the use of problem-focused strategies. Finally, as expected, individuals who reported high emotional exhaustion and depersonalization also reported high levels of stress. Interestingly, stress was not here correlated with inefficacy, suggesting that experiencing stress as a resident may not connected to a feeling of inefficacy: Stressed residents, although more anxious, depressed and exhausted, appeared to still see themselves as efficient and able to achieve their work, maybe because of the 'not-yet-eroded' energy of their age, of a greater fear of being negatively evaluated, of a misappreciation of their efficacy, or of the pressure of related to their precarious position.

Because the CFA indicated a strong correlation between WO and MA, we recommend scoring the IMRSS using both the subscale scores or the general IMRSS score. Percentile-based cut-off scores are provided with the items, although more research is needed on sensitivity and specificity to provide a scoring system that permits the prediction of disorders (major depression disorder, substance use disorder, etc.) or work-related issues (medical leaves, medical errors, etc.).

The sample is specific, and may prevent generalizing the robustness that was observed to other populations. Nevertheless, as the content of the scale echoes investigations of the psychosocial well-being of residents in general (Levey, 2001), the IMRSS may be usable – and we encourage its study – with other medical residents. For this reason, an English translation of the items is provided. Additionally, the IMRSS, though recommendable as a screening tool because of its length and its robustness, is not designed to exhaustively identify potential sources of stress like a wide-ranging inventory. Nevertheless, the nature of medical practice and the fast pace of hospital environments call for the frequent use of short measures, rather than for the one-time use of long inventories.

As previously recommended (Levey, 2001), assessing the stress of residents should be part of the clinical services for the implementation of Effective Residents' Assistance Programs. Accounting for the length/exhaustiveness trade-off that was made, the present research provides a brief but robust and experience-driven tool for such assessment.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix 1

The Internal Medicine Resident Stress Scale

Here is a list of elements that may have caused you stress during the past 3 months. Please indicate to what extent these elements have stressed you, on a scale from 1 (these elements did not cause any stress) to 5 (these elements caused a lot of stress).

(*Voici une série d'éléments qui ont pu vous stresser depuis les 3 derniers mois. Veuillez indiquer à quel point ces éléments vous ont stressé(e), sur une échelle de 1 (ils ne vous ont pas stressé du tout) à 5 (ils vous ont beaucoup stressé(e)).*)

Item number	Subscale	Item (French original version)
1	WO	Feeling tired. (*Le fait de se sentir fatigué.*)
2	WO	Work rythm: work hours, restless days, shifts. (*Le rythme de travail: les horaires, l'enchainement des journées sans repos, les gardes.*)
5	WO	Work load and time spent at the hospital. *(La charge de travail, le temps passé à l'hôpital.)*
6	WO	The lack of time spent with family and close friends. (*Le manque de temps passé en famille, avec les proches.*)
9	WO	The lack of sleep, or the lack of rest (*Le manque de sommeil ou le sommeil de mauvaise qualité.*)
3	MA	Starting a new residency. (*L'arrivée dans un nouveau stage.*)
4	MA	Being responsible for people's lives. (*Le fait d'être responsable de vies humaines.*)
7	MA	The lack of theoretical knowledge. (*Le manque de connaissances théoriques.*)
8	MA	The lack of experience. (*Le manque d'expérience.*)

Notes: Participants respond using a 5-point Likert scale (1: Not at all; 2; 3; 4; 5: A lot). Each item yields a score from 1 to 5. High scores indicate higher levels of stress. Based on 75th and 90th percentile ranks, we suggest that WO scores above or equal to 20 and 22 respectively indicate moderate and severe Work Overload stress, and that MA scores above or equal to 18 and 19 respectively indicate moderate and severe Medical Accountability stress.