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## **Initial Psychometric Evaluation of a Psychological Resilience Measure for Physicians**

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## **Initial Psychometric Evaluation of a Psychological Resilience Measure for Physicians**

### **Abstract**

Measures of Psychological Resilience (PR) for use with physician populations are lacking. The objective of this study is to develop and assess the validity and internal consistency of a survey designed to measure the perceived Psychological Resilience (PR) of physicians. A 37-item PR survey was developed and distributed to doctors from an Irish teaching hospital. Construct validity was established through a confirmatory factor analysis and internal consistency using Cronbach's alpha. Discriminant and convergent validity were assessed through correlating responses to the PR measure with the three subscales of the Maslach Burnout Inventory- Human Services Survey (MBI-HSS). A total of 292 responses to the survey were suitable for inclusion in the analysis. Confirmatory factor analysis resulted in an 18-item survey with three subscales: job gratification ( $\alpha=0.79$ ), protective practices ( $\alpha=0.83$ ), and protective attitudes ( $\alpha=0.81$ ). There were significant negative correlations between the three subscales of the PR survey and the emotional exhaustion and depersonalization subscales of the MBI-HSS. There were significant positive correlation between each of the three subscales of the PR survey and the MBI-HSS personal accomplishment subscale. This study is the first stage in the development of an appropriate, valid and reliable survey for measuring the PR of physicians.

## Introduction

Research suggests that a half of physicians experience burnout[1]. Physician burnout has been found to be associated with poor patient care[2], unprofessional behaviour[2], low job satisfaction[3], decreased mental health[4], decreased quality of care[5], decreased productivity[6], self-reported errors in patient care[7], and reduced engagement [8]. It has been suggested that the focus on burnout as a medical diagnosis in addition to inadequate approaches to measurement have hampered progress in reducing burnout [9]. Therefore, there is a growing interest in promoting psychological resilience (PR) among physicians as an approach to combating burnout [10,11].

PR can be defined as *'the role of mental processes and behaviour in promoting personal assets and protecting an individual from the potential negative effect of stressors'* (p16)[12]. Recent theories propose that resilience is a product of adversity and that levels of resilience are determined by both internal (e.g., presence or absence of psychiatric symptoms) and external factors (e.g., occupational factors), which may be contextual or transient[12,13]. It has been suggested that it is important to focus on the positive aspects of psychology and to develop these positive aspects of individual coping[14]. Therefore, there is a need to shift from the pathology-based focus on burnout, to the strength-based approach of positive psychology[15]. However, a clear understanding of how PR is manifested in doctors, and how to improve or sustain PR in this group, is largely lacking[16].

The working environment and responsibilities of physicians are unique. A valid measure of resilience will provide information on how PR is manifested in a physician population, and provide an understanding of levels of PR in this population (rather than only levels of stress

and burnout)[11,15,16]. A valid measure will support an improved understanding of PR and how it relates to stress and burnout, and the design, and evaluation of the growing body of interventions that are being used to increase PR in physician populations[11,16]. A measure of PR will also allow comparisons to be made across units in hospitals. This unit level information would support an understanding of the system drivers (e.g. a supportive working environment) that impact PR [9]. This information is vital in order to be able to examine how PR can be improved through changing the system in which physicians work. Therefore, the purpose of this paper is to describe the development and assessment of the validity and internal consistency of a survey (known as ResMed) specifically designed to measure the perceived PR of physicians.

## **Method**

### ***Survey development***

The survey was derived from two sources: (1) semi-structured interviews carried out with 68 Irish physicians[16]; and (2) an examination of the surveys used to evaluate the effectiveness of physician resilience interventions from papers included in a recent systematic review[11]. The interviews addressed how physicians define resilience, the primary challenges to resilience, and practices or strategies perceived by physicians to sustain resilience[16]. For the purposes of developing the ResMed survey, we focused on the descriptions provided by the interview participants of the practices and strategies perceived by physicians to play a role in their own, and others', levels of resilience. The analysis of the interview data resulted in three pertinent themes:

- job-related gratification- taking satisfaction from the job of a physician;
- resilient strategies (protective practices)- approaches to build/maintain resilience (e.g. good work-life balance); and

- resilient strategies (protective attitudes)- attitudes that promote or sustain PR (e.g. not taking things personally)[16].

Two PhD-level psychologists who had participated in the theming of the interviews also developed the items for the ResMed survey. Items were developed for each of the themes that emerged from the interviews. This process resulted in an initial set of items grouped into three subscales: job-related gratification (7 items); protective practices (20 items); and protective attitudes (10 items). The response scale used a five-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’. There were also three demographic questions: on gender, level of seniority, and years of work experience.

The 37-item survey was piloted with 10 physicians at different levels of seniority and from a range of specialties. The focus of the pilot was on the clarity of the wording of the items. Some minor changes were made to the wording of a number of items (e.g. descriptions of the level of seniority).

### ***Ethical Consideration***

Ethical approval was obtained from the Research Ethics Committee at Galway University Hospital.

### ***Procedure***

The anonymous survey was distributed to postgraduate doctors at education and teaching events in the participating hospital between June 2017 and January 2018. Potential participants were given the opportunity to complete either a paper, or an online, version of the survey.

The survey consisted of ResMed, the Maslach Burnout Inventory- Human Services Survey (MBI- HSS)[17], and demographic questions. The MBI-HSS is a 22-item measure of burnout intended for use with individuals working in human services. It has been demonstrated to have acceptable psychometric properties[18], and has been widely used with physician populations in the past[15]. The MBI-HSS consists of three subscales: emotional exhaustion (9 items), depersonalization (5 items) and personal accomplishment (8 items). Participants indicate how often they have certain feelings using a 7-point rating scale from 0 (never) to 6 (every day). High scores on emotional exhaustion and depersonalization, and low scores on personal accomplishment are indicative of burnout[18]. However, within the medical literature, burnout in doctors has sometimes been considered to be characterized by high levels of emotional exhaustion or depersonalization[15].

### ***Statistical Analysis***

#### *Initial Data Screening*

We assessed the skewness (asymmetry of the distribution of responses) and kurtosis (the sharpness of the peak of a frequency-distribution curve) of each item by examining the: histogram of the responses; skewness value; z-score for skewness; kurtosis value; and z-score for kurtosis. For sample sizes greater than 200, it has been suggested that a skewness value of  $<2$ , and kurtosis value of  $<7$ , are acceptable[19]. However, other authors suggest considering the z-scores for skewness and kurtosis[20,21]. We assessed the internal consistency of the proposed subscales using Cronbach's alpha. Cronbach's alpha values of greater than 0.7 are generally considered to provide evidence of good internal consistency[22].



### *Construct Validity*

Construct validity is concerned with whether the items in the subscale reflect the same construct [23]. We established the construct validity of the initial three subscales in ResMed through a Confirmatory factor analysis (CFA) technique as implemented by EQS for windows. As CFA does not allow for missing values, those participants that did not provide a response to every item were discarded from the analysis. CFA is used to evaluate whether the number of factors (the term from subscale within the context of CFA), and the loadings of measured variables (the survey items) on these factors, conforms to what is expected by theory[24]. The rationale behind taking a confirmatory, as opposed to an exploratory, approach is that the subscales and items were derived from the themes identified from the interview study.

In order to evaluate the ‘fit’ of the data to the model the  $\chi^2$  statistic was used in association with, the Comparative Fit Index (CFI), the Goodness-of-Fit Index (GFI), and the Root Mean Square Error of Approximation (RMSEA). A robust maximum likelihood method was used to estimate parameters as this is appropriate for Likert scale responses and when there are high levels of skewness and kurtosis in the responses to the items[25].

The GFI and chi-square are absolute fit indices. A non-significant chi-square is indicative of a good model fit. However, chi-square is considered to be of limited use as it is affected by sample size, number of variables, and assumes multivariate normality[26]. The CFI is an incremental fit index that produces a statistic from 0 to 1. A value of 0.9 or higher is generally considered to be the minimum for model acceptance for both the CFI and GFI[24]. The RMSEA is computed based on sample size, the noncentrality parameter, and degrees of freedom for the target model [27]. Models that are good descriptors of the data should

produce RMSEA values of less than .05, with values less than .08 considered to be a 'reasonable fit'.

Should a model fail to provide an adequate fit for the data, it is possible to make changes to the model based upon the results of the Lagrange multiplier test for adding parameters and the Wald test for removing parameters[24]. Any changes should be meaningful, and care should be taken to avoid overfitting a model[24]. If the model is re-specified, it is important to understand that the analysis is now framed in an exploratory rather than confirmatory mode[20,24].

#### *Internal Consistency*

Internal consistency is the extent to which items within a subscale are inter-correlated. This was assessed using Cronbach's alpha.

#### *Assessment of Discriminant and Convergent Validity*

Discriminant and convergent validity are subtypes of construct validity. Discriminant validity tests whether concepts that are unrelated are really actually unrelated[23]. Convergent validity refers to the degree to which two concepts that should be related, are actually related[23].

These two types of validity were assessed by calculating Pearson's product moment correlations between the subscales of ResMed and the MBI-HSS. A negative correlation between the ResMed subscale scores and the MBI-HSS subscale scores for emotional exhaustion and depersonalization would provide evidence of convergent validity. A positive correlation between the ResMed subscale scores and the MBI-HSS subscale score for personal accomplishment would provide evidence of convergent validity.

## **Results**

A total of 322 (154 online, and 168 on paper) completed surveys were received. It is not possible to calculate a response rate for online completions, but the response rate for the paper surveys was 42.0% (168/400).

A total of 292 respondents were included in the CFA. It was necessary to discard 30 of these responses from further analysis as there was one or more missing response to the ResMed survey. Of the included responses, 51.7% were female (151/292). A total of 33.6% (98/292) of the respondents were interns (equivalent to first year residents), 36.3% (106/292) were more senior non-consultant hospital doctors (equivalent to second year residents and above), 26.7% (78/292) were from consultants (equivalent to attending physicians), and 3.4% (10/292) provided no data on role. The respondents reported a mean of 8.3 years of clinical experience (st dev=9.9).

### ***Initial Screening***

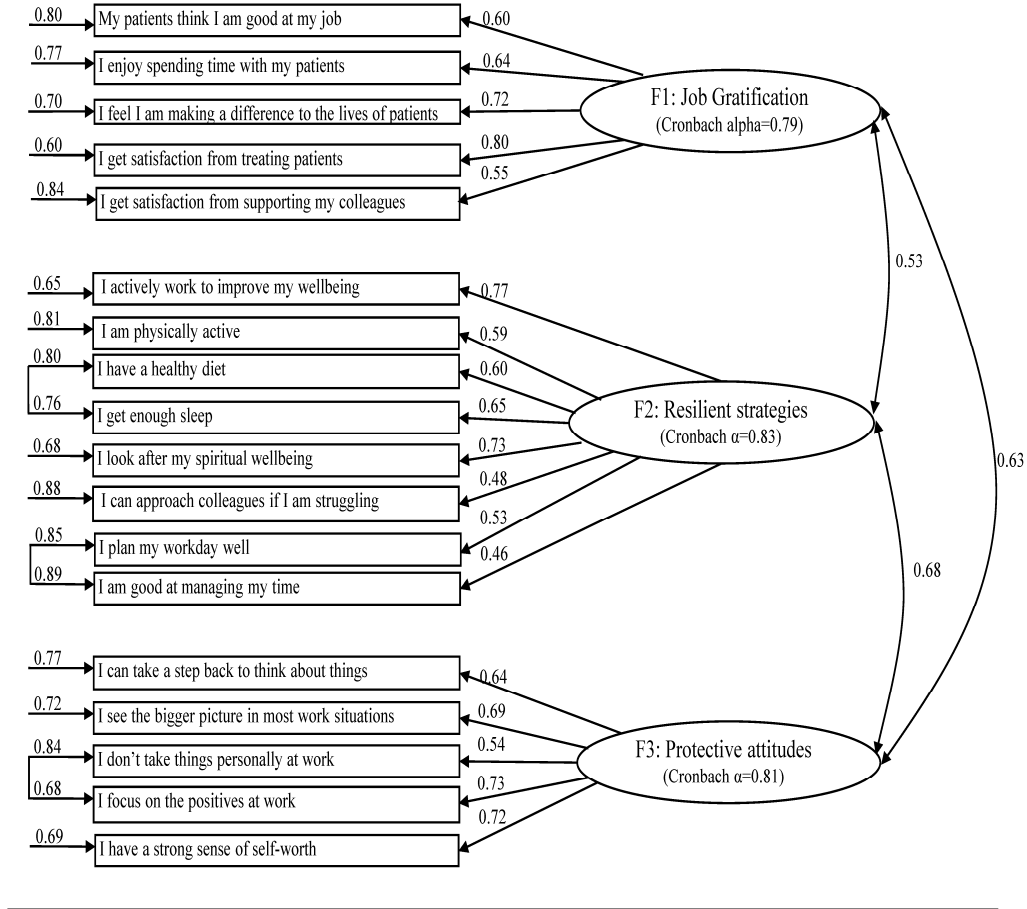
Although the values of skewness and kurtosis were acceptable, from examining the histograms of the responses to each items and considering the absolute z-values of skewness and kurtosis, it was decided to remove 16 items based upon high were removed from further analysis due to high levels of skewness and kurtosis: 2 items from the ‘job gratification’ factor; 9 items from the ‘protective work practices’ factor; and 5 items from the ‘protective attitudes’ factor. As part of the subsequent assessment of internal consistency, one item was removed from the ‘job gratification’ factor, and two items from the ‘protective practices’ factor. Cronbach’s alphas were subsequently found to be 0.8 or higher for each of the three factors.

### ***Construct Validity***

The remaining 18 items were entered into a CFA with a three factor model with correlations allowed between all factors. The fit was not found to be acceptable on any of the fit indices ( $\chi^2 = 323.7$ ,  $df = 132$ ,  $p < 0.001$ ; CFI = 0.85; GFI = 0.86; and RMSEA = 0.07). Therefore, iterative changes were made to the model by allowing covariance between the three pairs of measurement errors (see Figure 1). The correlations between the pairs of measurement errors terms were based upon the output of the Lagrange multiplier test for adding parameters, and were consistent with theory.

The covariance between the three pairs of measurement errors resulted in a revised model with an acceptable level of fit on all indices except chi-square ( $\chi^2 = 232.3$ ,  $df = 129$ ,  $p < 0.001$ ; CFI = 0.92; GFI = 0.90; and RMSEA = 0.05). Figure 1 shows the standardized solution for the final model.

Figure 1. Standardised confirmatory factor analysis solution for ResMed.



Measurement error      Observed variables (questionnaire items)      Path coefficient for regression of the observed variable onto the unobserved factor      Unobserved factors (sub-scales)      Factor covariance

**Key:** Explanation of symbols associated with CFA

A correlation matrix between all of the ResMed and MBI-HSS subscales is shown in Table 1.

Table 1. Pearson’s correlations between the ResMed and MBI-HSS subscales.

		ResMed			MBI-HSS		
		Job gratification	Protective practices	Protective attitudes	Emotional exhaustion	De-personalization	Personal accomplishment
ResMed	Job gratification		.46*	.49*	-.36*	-.41*	.51*
	Protective practices	.46*		.53*	-.56*	-.42*	.31*
	Protective attitudes	.49*	.53*		-.50*	-.34*	.37*
MBI-HSS	Emotional exhaustion	-.36*	-.56*	-.50*		.61*	-.11
	De-personalization	-.41*	-.42*	-.34*	.61*		-.22*
	Personal accomplishment	.51*	.31*	.37*	-.11	-.23*	

\*p<0.01

### ***Internal Consistency***

As can be seen from Figure 1, all of the Cronbach’s alpha values are greater than 0.7 for all three subscales. Therefore, there is evidence of internal consistency for the three subscales, 18-item ResMed.

### ***Assessment of Discriminant and Convergent Validity***

Table 1 shows the correlations between the ResMed and MBI-HSS subscales. As can be seen from Table 1, there is a significant negative correlation between the three ResMed subscales and the emotional exhaustion and depersonalization subscales-evidence for discriminant validity. There is a significant positive correlation between each of the ResMed subscales and the personal accomplishment subscale- evidence for convergent validity.

INSERT TABLE 1

## **Discussion**

It has been suggested that there is a need to shift from the pathology-based focus on physician burnout to the strength-based approach of positive psychology[15]. However, if we are to understand PR, we need to seek new measures that are specific to physicians[15]. Our study outlines the first steps in the development and testing of a survey designed to measure the PR of physicians.

Nineteen of the original items were removed as part of the development of the survey. The practice of discarding items is common in survey development[28], and should be expected when developing a new survey. A survey should be internally consistent and be parsimonious, comprised of the minimum number of items that adequately assess the domain of interest[29]. We believe that this has been achieved with the ResMed survey. Research also indicates that response rates are higher to shorter surveys[30].

The three factor model matches the three themes derived from the interview study on which the ResMed survey was predominantly based[16], and had an acceptable fit on three of the four fit indices. A significant chi-square test may be indicative of a poor fit. However, the sample size was relatively large, there were a relatively large number of items, and there was some modest to high level skewness and kurtosis in the responses to the items. Therefore, a significant chi-square was not unexpected. As an acceptable fit was found with the other indices we are confident that the three factor model is a valid representation of the data.

This paper only describes the initial development of the survey. Although the three factor model appears to provide an acceptable fit, the model should be tested with data collected from another sample of physicians. Other aspects of psychometrics that should be examined

are: reproducibility (does the same factor structure result from the analysis of another sample of responses?); responsiveness (is there survey sensitive to changes?): and interpretability (can qualitative meaning be assigned to the quantitative scores?)[31].

### ***Implications for Clinicians***

The ResMed survey could be used to fill a gap that currently exists in understanding PR in physician populations[11,16], and identify where, and what, interventions are required to improve PR. The correlation between the ResMed subscale scores and the MBI-HSS subscale score are important findings not just for the validity of the questionnaire, but also for the potential of reducing burnout through increasing PR. It is not possible to draw a causal link from the cross-sectional survey study reported in this paper. However, through the development of a valid and reliable measure of PR the possibility of identifying whether there is a causal relationship could be examined.

ResMed could also be used to measure the effectiveness of interventions focused on improving PR, or to provide a baseline measure of the PR of doctors working in a particular unit or hospital. Such applications would contribute to furthering our knowledge and understanding of the contributors to stress, burnout and PR among physicians. Moreover, with some adaptation, it may be possible to use ResMed to assess PR in other groups of healthcare professional groups.

### ***Strengths and Limitations***



The strengths of the study are that we received a relatively large number of responses from physicians from a range of backgrounds and levels of experience, and that we followed best practice in the development of the survey items, and the assessment of the reliability and validity. However, there are some limitations that should be considered also. First, the total response rate (41%) to the survey may be considered a limitation. Although lower than desirable, the response rate is not atypical for survey studies conducted among medical professionals[32]. Second, responses were only obtained from doctors from one teaching hospital in Ireland. Therefore, the generalizability of the findings from this sample cannot be assumed. Third, as part of the post-hoc analysis, changes were made to the original three factor model for the ResMed survey. If the model is re-specified, it is important to understand that the analysis is now framed in an exploratory rather than confirmatory mode[24]. However, given that this is a new survey we believe that this approach is acceptable. Further, the non-alignment of ResMed survey with a single theory of PR may be criticized. This is largely because there is no single theory of PR from which to draw[11,16]. Instead, the items for ResMed were derived from the analysis of the lived experiences of physicians[10,16] with the qualitative data interpreted in the context of the extant literature on stress and coping[16].

### **Conclusions**

Given the negative impact of stress and burnout upon both the physician and their patients, there is a need to consider how to increase PR among physicians. However, in order to foster PR, there is a need for valid measures to identify where PR can be improved, and the effects of interventions designed to improve PR. The ResMed survey has the potential to allow for the assessment, and study, of PR in a physician population. This will support a move from a pathological-based focus on burnout, and shift the emphasis onto how physicians are able to be resilient.

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**Ethical approval:** Ethical approval was obtained from the Clinical Research Ethics Committee at Galway University Hospital.

**Data availability:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available as this was not something to which the participants consented to prior to participation.

**Biographical note.** Dr. Paul O'Connor is a human factors psychologist and lecturer in Primary Care, and Research Director of the Irish Centre for Applied Patient Safety and Simulation at the National University of Ireland, Galway.

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