

# Empathy of medical students and personality: Evidence from the Five-Factor Model

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## Abstract

The main aim of this study was to test hypothetical associations between personality dimensions and empathy scores in medical students. The Portuguese version of NEO-FFI was administered in order to characterize participants in terms of five personality traits: Neuroticism, Extraversion, Agreeableness, Openness to Experience, and Conscientiousness. Self-reported empathy measures were obtained with the Portuguese version of the Jefferson Scale of Physician Empathy (JSPE-spv), a Likert-type questionnaire specifically developed for administration in health sciences settings that measures domains, such as compassionate care and perspective taking. Correlation analysis, multivariate analysis of covariance, and logistic regression analysis were conducted. The results confirmed positive associations between agreeableness, openness to experience and empathy, and did not support our hypothesis of negative associations between neuroticism and empathy. It is suggested that the personality of students should be taken into account in programs to enhance empathy in undergraduate medical education.

## Introduction

Empathy is a crucial ingredient in the physician–patient relationship (Von Fragstein et al. 2008). Physician empathy is positively associated with patient confidence in the doctor (Johnson 1990) and also with clinical outcomes (Hojat et al. 2011). The medical education literature provides multiple definitions of empathy (Johnson 1990) as a blend of a cognitive and an affective component (Hojat 2007; Rahimi-Madiseh et al. 2010). The cognitive component refers to the ability of physicians to understand patients' emotions and to communicate such understanding back to the patients (Hojat et al. 2002), whereas the affective component refers to how doctors respond emotionally to patients (Rahimi-Madiseh et al. 2010). To enhance medical students' empathy, undergraduate medical programs can adopt different approaches, for example role playing or training in clinical simulation centers (Hojat 2009).

Personality is one of the many factors that influence empathy within the context of patient care (Hojat et al. 2005). The Five-Factor Model (FFM) provides a comprehensive framework for describing personality in adults with the following dimensions: Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness (Costa et al. 2001; Muck et al. 2007). Conscientiousness includes characteristics such as self-discipline, persistence, and striving for achievement. Extraversion consists of attributes such as sociability, positive affect, and energetic behavior. Agreeableness refers to altruistic, affective, and collaborative behaviors. Neuroticism comprises characteristics such as anxiety, fearfulness, and insecurity in relationships. Openness to Experience blends Openness – which includes traits such as active imagination and esthetic sensitivity – with Intellect – that involves intellectual curiosity and insightfulness

## Practice points

- The FFM of personality clarifies associations between personality and empathy in medical education.
- Agreeableness and Openness to Experience are positively associated with self-reported empathy measures.
- Neuroticism, Conscientiousness, and Extraversion do not show associations with empathy.
- Education to enhance empathy in students must consider student personality.

(Lievens et al. 2002; Caspi et al. 2005). The FFM has been used in many cultures and applied extensively in research studies in higher education (e.g., Carmel & Glick 1996; Nettle & Liddle 2008).

There are many instruments based on the FFM available to assess adult personality such as the “Five Factor Model Inventory” (Goldberg 1992), and the “Revised NEO Personality Inventory” (NEO-PI-R; Costa & McCrae 1992). The original comprehensive NEO-PI-R with 240 items and the corresponding shorter versions are the most widely used (e.g., McCrae et al. 1999, 2005; Aluja et al. 2005; Lucas & Donnellan 2009).

There are studies that indicate hypothetical negative (Pedersen 2009; Neuman et al. 2011) and positive (Magalhães et al. 2011) developments in the empathy of students in medical schools. The empathy of medical students was associated with the personality traits Sociability (positive) and Aggression-Hostility (negative), using the Zuckerman-Kuhlman Personality Questionnaire (Hojat et al. 2005). To understand how empathy can be enhanced during medical education, associations between personality dimensions and

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**Table 1.** Study population by gender, year of studies, and empathy scores.

	Empathy – top tercile ( <i>N</i> = 124) Frequency (%)	Bottom tercile ( <i>N</i> = 118) Frequency (%)	Total ( <i>N</i> = 242) Frequency (%)
Gender			
Males	29 (23)	39 (33)	68 (28)
Females	95 (77)	79 (67)	174 (72)
Year of study			
First year	81 (65)	105 (89)	186 (77)
Sixth year	43 (35)	13 (11)	56 (23)

empathy need to be clarified, which requires the use of robust cross-cultural personality frameworks. This study aimed to test three hypothetical associations: that both Agreeableness and Openness to Experience are significantly and positively correlated with medical students' empathy while Neuroticism is significantly and negatively correlated with medical students' empathy.

## Methods

### Participants

The study sample comprised of 350 medical students from six entering classes (*n* = 511) at the School of Health Sciences of the University of Minho, of whom 244 were females (69.8%). This is a typical gender distribution in Minho (in the study period the percentages of females varied between 64% and 67%) where nearly 100% of students are of Caucasian ethnicity. A sub-sample of 242 students was selected to compare the students with the highest (top tercile) and the lowest (bottom tercile) empathy scores (Table 1).

### Instruments

The five personality dimensions were assessed with the Portuguese version of NEO-FFI inventory (Magalhães et al. 2012). It uses a five-point *Likert* scale ranging from 0 (strongly disagree) to 4 (strongly agree) and can be completed in approximately 15 minutes. The Portuguese version of the NEO-FFI includes 60 items similar to the original North American instrument and corroborates the well-established cross-cultural reliability, factorial structure, and the communalities of personality according to gender, age, and educational differences (Magalhães et al. 2012).

Empathy was measured with the self-administered Jefferson Scale of Physician Empathy (JSPE) – students Portuguese version (JSPE-spv) that includes 20 items answered on a *Likert* type scale: from 1 (strongly disagree) to 7 (strongly agree), and aggregated in three factors: “Perspective Taking” (10 items), “Compassionate Care” (8 items), and “Standing in the Patient’s Shoes” (2 items). The JSPE-spv has valid psychometric properties (Magalhães et al. 2010).

### Procedures and data analysis

First-year students answered the instruments on paper or in a computer lab during freshman welcome week. Sixth-year

students filled the forms on paper in their final week as undergraduates. This research was part of the ongoing Minho longitudinal study which is authorized by the Portuguese Commission for Data Protection (reference CNPD: 10432/2011). Participation was voluntary and individual (on paper and on-line in a secured computer facility) and data confidentiality was guaranteed. Data were analyzed with *PASW Statistics 18* (Predictive Analytics Software, IBM SPSS Statistics). Empathy was analyzed as a scale variable (continuous variable) for the correlation analysis and as categorical variable for the multivariate analysis of covariance (MANCOVA) and the logistic regression analysis. Students were categorized into two groups: “bottom” (low empathy, *N* = 118) and “top” students (high empathy, *N* = 125) according to their empathy (JSPE-spv total) score. The categorization into these two groups was made considering that the main objective of this study was to differentiate medical students on their empathy JSPE-spv scores. Therefore, the students at the extremes could be more easily differentiated on their personality traits than those with intermediate self-reported empathy.

## Results

### Descriptive and correlation analysis

We found significant and positive correlations between total score in the JSPE scale and Openness to Experience ( $r = 0.22$ ,  $p < 0.01$ ), Agreeableness ( $r = 0.24$ ,  $p < 0.01$ ), and Conscientiousness ( $r = 0.14$ ,  $p < 0.05$ ). The magnitudes of correlations between personality and scores of self-reported empathy were low, ranging from  $-0.01$  to  $0.24$  (Table 2).

### Multivariate analysis of covariance

Considering the low magnitudes of correlations reported in Table 2, we split the sample into three sub-samples according to the total JSPE-spv scores and conducted a MANCOVA using gender as covariate, to identify the personality dimensions that would be significantly different between the sub-samples “bottom” (1st tercile) and “top” (3rd tercile). Before the application of MANCOVA, the homogeneity of covariance matrices was tested by Box’s Test of Equality of Covariance Matrices ( $p = 0.651$ ) and by Levene’s Test of Equality of Error Variances (Neuroticism:  $p = 0.553$ ; Extraversion:  $p = 0.328$ ; Openness:  $p = 0.647$ ; Agreeableness:  $p = 0.727$ ; Conscientiousness:  $p = 0.904$ ). The covariance matrices were

**Table 2.** Descriptive and correlation analysis.

	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
Total score in the JSPE-sv scale	-0.01	0.04	0.22**	0.24**	0.14*
Neuroticism		-0.40**	-0.07	-0.05	-0.24**
Extraversion			0.12	0.13*	0.19**
Openness				0.19**	-0.04
Agreeableness					0.21**
Total mean (SD)	23.6 (7.9)	31.4 (5.5)	30.3 (5.5)	33.8 (5.2)	33.4 (6.3)
Bottom group – mean (SD)	23.9(8.0)	31.2 (5.6)	29.1 (5.5)	32.6 (5.1)	32.7 (6.1)
Top group – mean (SD)	23.4 (7.8)	31.5 (5.3)	31.5 (5.2)	34.9 (4.9)	34.1 (6.5)

Note: N = 242; \*p < 0.05; \*\*p < 0.01.

**Table 3.** Logistic regression results for predicting medical students self-reported empathy using Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness as independent variables.

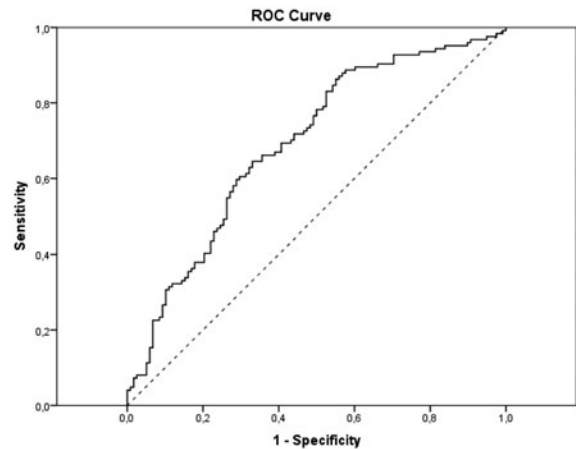
	B	SE	$\chi^2_{\text{Wald}}(1)$	p	Exp(B)	CI 95% Exp(B)
Neuroticism	-0.001	0.019	0.001	0.971	0.999	]0.963; 1.037[
Extraversion	-0.017	0.028	0.384	0.535	0.983	]0.931; 1.038[
Openness	0.080	0.026	9.200	0.002	1.083	]1.029; 1.141[
Agreeableness	0.075	0.029	6.785	0.009	1.078	]1.019; 1.141[
Conscientiousness	0.032	0.023	1.976	0.160	1.032	]0.988; 1.079[
Constant	-5.433	1.702	10.189	0.001	0.004	
Pseudo- $R^2$ (Nagelkerke)	0.123					

homogeneous, as indicated by the non-significant *p*-values. Multicollinearity and singularity were tested by Residual SSCP Matrix and were guaranteed with intercorrelations between the five factors lower than 0.80.

The model with five factors was significantly influenced by self-reported empathy (*p* < 0.01) after accounting for the effect of gender (*p* < 0.001) as a covariate. Results indicated that students assigned to the “top” sub-sample scored significantly higher on Openness to Experience (*p* < 0.001) and Agreeableness (*p* < 0.01) than those in the “bottom” group after accounting for the effect of gender as a covariate (Openness to Experience, *p* = 0.624; Agreeableness *p* < 0.001). The MANCOVA analysis did not reveal significant differences in Conscientiousness between the sub-samples.

Logistic regression

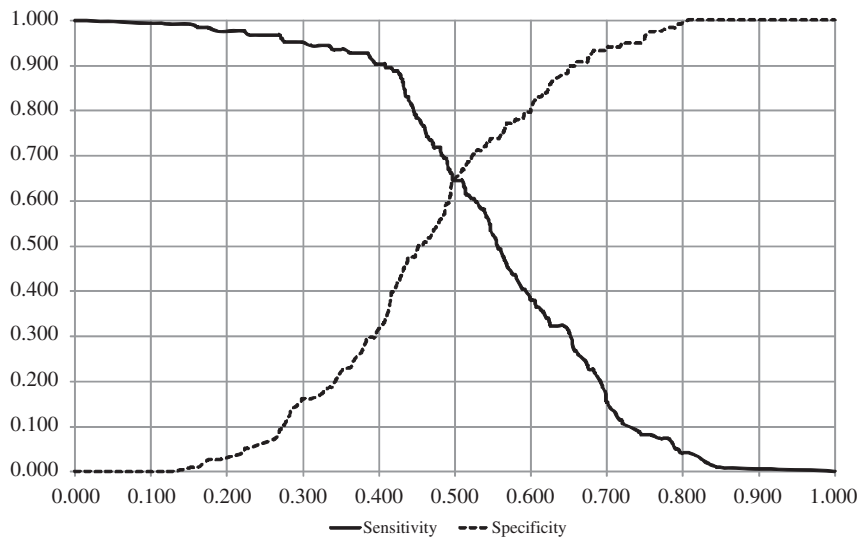
To determine to which extent personality dimensions influence the JSPE-spv scores, we conducted a logistic regression analysis in which the dichotomized dependent variable was belonging to the bottom or to the top sub-samples. The regression provided a statistically significant five-predictor model ( $\chi^2(5) = 23.5, p < 0.01$ ). The Hosmer and Lemeshow test assesses the null hypothesis that the predicted probabilities match the obtained probabilities. In this study, a non-significant *p*-value revealed a fit model ( $\chi^2_{\text{HL}}(8) = 11.26, p = 0.187$ ). The Nagelkerke pseudo- $R^2$  indicated that the model accounted for 12% of the total variance. This suggests that the set of predictors discriminated between students in the bottom and top sub-samples. The overall hit rate was 64.9% (an increase of 15% compared to the proportional percentage



**Figure 1.** ROC curve predictive model for empathy.

of correct classification by chance  $[(118/242)^2 + (124/242)^2] \times 100\% = 50\%$ ). Correct prediction rates of 64.5% for the most empathic students (Sensitivity) and 65.3% for the least empathic students (Specificity) were found. Table 3 presents the regression coefficients (*B*), the coefficients standard errors (SEs), the Wald statistics, the significance level (*p*), the odds ratios (ORs) [Exp(*B*)], and the 95% confidence intervals (CI) for ORs for each predictor.

The Wald test shows that the personality traits Openness to Experience ( $\chi^2_{\text{Wald}}(1) = 9.2, p < 0.01$ ) and Agreeableness ( $\chi^2_{\text{Wald}}(1) = 6.79, p < 0.01$ ) are statistically significant predictors of falling into one of the two sub-samples. For each five point increase in the Openness to Experience score, there is a 1.49 times greater likelihood of falling in the top group of empathy



**Figure 2.** Optimal cut-off value using the sensitivity and specificity of the model.

scores, controlling the other variables in the model. Similar results for Agreeableness were obtained. For each five point increase there is a 1.46 times greater likelihood of falling in the top group of empathy scores, controlling the other variables in the model.

In order to determine the optimal cut-off value, a *receiver operating characteristic* (ROC) curve analysis was performed (Figure 1).

The area under the curve was 0.69, which is significantly higher than 0.5 ( $p < 0.001$ ). This result suggests that the model for empathy has reasonably predictive ability.

Considering the optimal cut-off value 0.496 (Figure 2), the model accurately classifies 66.1% of students in top (Sensitivity) and 64.4% of students in bottom group (Specificity). The hit rate would increase to 65.3%, which according to a binomial proportion test is significantly higher than 50% ( $p < 0.001$ ).

## Discussion

This study aimed to test hypothetical associations between personality dimensions and a self-reported measure of undergraduate student empathy in a Portuguese medical school. To assess personality, we used the FFM framework which has well-established reproducibility across cultures (McCrae & Allik 2002; Poortinga et al. 2002). Our initial analysis revealed positive and significant but low magnitude correlations between empathy JSPE-spv scores and Agreeableness, Openness to Experience, and Conscientiousness. To clarify the association of the three dimensions with JSPE-spv scores, we conducted MANCOVA using gender as covariate and a logistic regression with two sub-samples corresponding to the first and third JSPE-spv scores terciles. We confirmed the existence of significant positive associations between JSPE-spv scores and Agreeableness and Openness to Experience, but not with Conscientiousness. The results confirmed positive associations between agreeableness, openness to experience and empathy, and did not support our hypothesis of negative

associations between neuroticism and empathy. Furthermore, we found that using Agreeableness and Openness to Experience as predictors, we could assign 65% of the students to the bottom and top groups in JSPE-spv scores, an increase in 15% of correct classification over chance, close to the added predictive power of behavior by personality is 16% (Chamorro-Premuzic 2007). In summary, highly Agreeable and Open to Experience students, are more likely to be more empathetic.

The positive association between Agreeableness and empathy was expected, since the two constructs share attributes related to interpersonal skills, for example altruism and social behavior (Ashton & Lee 2001; Hojat et al. 2005; Chamorro-Premuzic 2007; Caprara et al. 2010). One would expect more agreeable persons to take the patient perspective more easily and to communicate better with patients. The finding is coherent with reported positive associations between medical student agreeableness and preference for “person-oriented” specialties (Borges & Gibson 2005). A positive association of Openness to experience with empathy was also expected. Empathy has a component of understanding the other, which implies a predisposition to meet and understand other people, and an ability to grasp the emotional and personal conditions of others. Openness to experience is the dimension that offers the necessary sensitivity and insightfulness for that purpose. The absence of associations between neuroticism and empathy was unexpected, since this dimension is associated with traits such as anxiety, insecurity in relationships, and distress in contacting the world (Caspi et al. 2005) which presumably would impact negatively on empathy. The absence of associations might result in first instance of lack of heterogeneity in neuroticism between the top and bottom groups. Further longitudinal research is necessary to understand how empathy development is conditioned by the different personality profiles.

The limitations of this study are the relatively small sample size from one institution, and the use of self-reported measures of both personality and empathy. Moreover, scores of empathy

reported the students' perceptions about these constructs, which may not reflect necessarily clinical skills in the context of patient care. The generalization of our findings call for observational ratings of empathy in multiple institutions across different educational contexts (the academic tutorial, the clinical clerkship, etc).

Our findings have important implications for the design of programs to enhance the empathy of medical students. Assuming that personality is stable across time, a way to enhance the empathy of senior students would be selecting the most agreeable and open to experience at application to medical school (Musson 2009). Even though this study is insufficient to recommend selection to medical school dependent on personality assessments, it suggests that choosing more agreeable and open to experience applicants might be a tool to enroll the most empathetic students and, in light of the associations between empathy and person-oriented specialties (Borges & Gibson 2005), to counteract the loss in applicants for residencies in primary care specialties (Jeffe et al. 2010). However, there are many unanswered questions to tackle before moving in that direction, from the generalization of our findings beyond this study's limitations, to the eventual definition of the adequate instrument and selection cut-off values. Finally, it is necessary to consider that in a context of selection, the desire to be selected may bias responses to the personality tests.

## Conclusions

This study revealed that the FFM dimensions of Openness to Experience and Agreeableness are positively associated with self-reported measures of empathy in undergraduate medical students. These two personality dimensions are reasonably predictive to differentiate upper and lower empathy scoring students. Our findings suggest that the personality of students should be taken into account in programs to enhance empathy in undergraduate medical education.

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