Cognitive and non-cognitive features of first year medical students: impact of gender on selection?

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I. BACKGROUND

Both cognitive and – more recently- non-cognitive measures have been associated with academic school outcome performance (Propat,2009).

Contribution of non-cognitive features to optimize selection of medical students has not been fully investigated notably been compared according to gender (Richardson, Abraham, Bond, 2012).

In Switzerland, medical school selection is based mostly on MCQ scores and cognitive measures.

The selection using cognitive methods of assessment might be enhanced with the addition of non-cognitive characteristics as well as taking into account gender specificities.

II. AIMS

- to compare cognitive and non-cognitive first-year medical students' profiles to other university students in less selective environments.

- to analyze the contribution of students' profiles to their performance during the selection year according to gender.

III. METHODS

Setting:
3 Universities faculties differing in students' gender distribution, type of exams, and in % of success rate
Participants:
First year university students (N= 658); medicine (n=327), human sciences (n=155), psychology (n=176)

Table 1: % Success rate after 1 year * Faculty

%	Medicine	Human Science	Psychology
Failures + Drop out	54%	17%	26%
Temporary Failure	26%	19%	26%
Success	20%	77%	48%
Tot	100%	100%	100%

Table 2: Crosstab Gender * Faculty

		Medicine	Human Science	Psychology	Tot
Gender	Men	110	88	25	223
	Women	217	67	151	435
	Tot	327	155	176	658

Medicine: high selective context vs. Human Science and Psychology: low to moderate selective context.
Around 20% of drop out after 1 year over all the three University schools.
More women overall the Faculties; significantly less men in Psychology and more women in Human Science, **Chi-Square= 66.680, p <.0001.**
Measures:
Previous High School Grades, Learning Approach, Personality, Motivation, University first exam grades (Personality, Motivation, University first exam grades data are currently not available for Human Science
Analysis:
Descriptive, Multivariate ANOVAs, Linear regression

Table 3: Measures

Variables	Measured by	Dimensions	Min/Max
School grades	Final high school Grade Points Average, Self-reported	- HS GPA	0 to 100
Learning Approach	Study Process Questionnaire2R (Biggs, 2011)	- Deep Approach DA, - Surface Approach SA	1 to 40
Personality	NEO FFI (Costa, 1994)	- Neuroticism, NEO N - Extraversion, NEO E - Openness, NEO O - Agreeableness, NEO A - Conscientiousness, NEO C	0 to 48
Motivation	Home-made scales, Self-reported	- Intrinsic (mission, vocation, altruism), MI - Extrinsic (income, status, executive job), ME - Care (patients, illness, life), MC - Studies (actual, at the beginning), MS	1 to 6
University grades	First exam university grades	- Uni grade	1 to 6

IV. RESULTS

Medical students personality according to US & UK norms

Graph 1: Medical students NEO T scores standardized following American and British norms

- MED MEN & US
- MED WOM & US
- MED MEN & UK
- MED WOM & UK

Normal T score range zone between 45 and 55
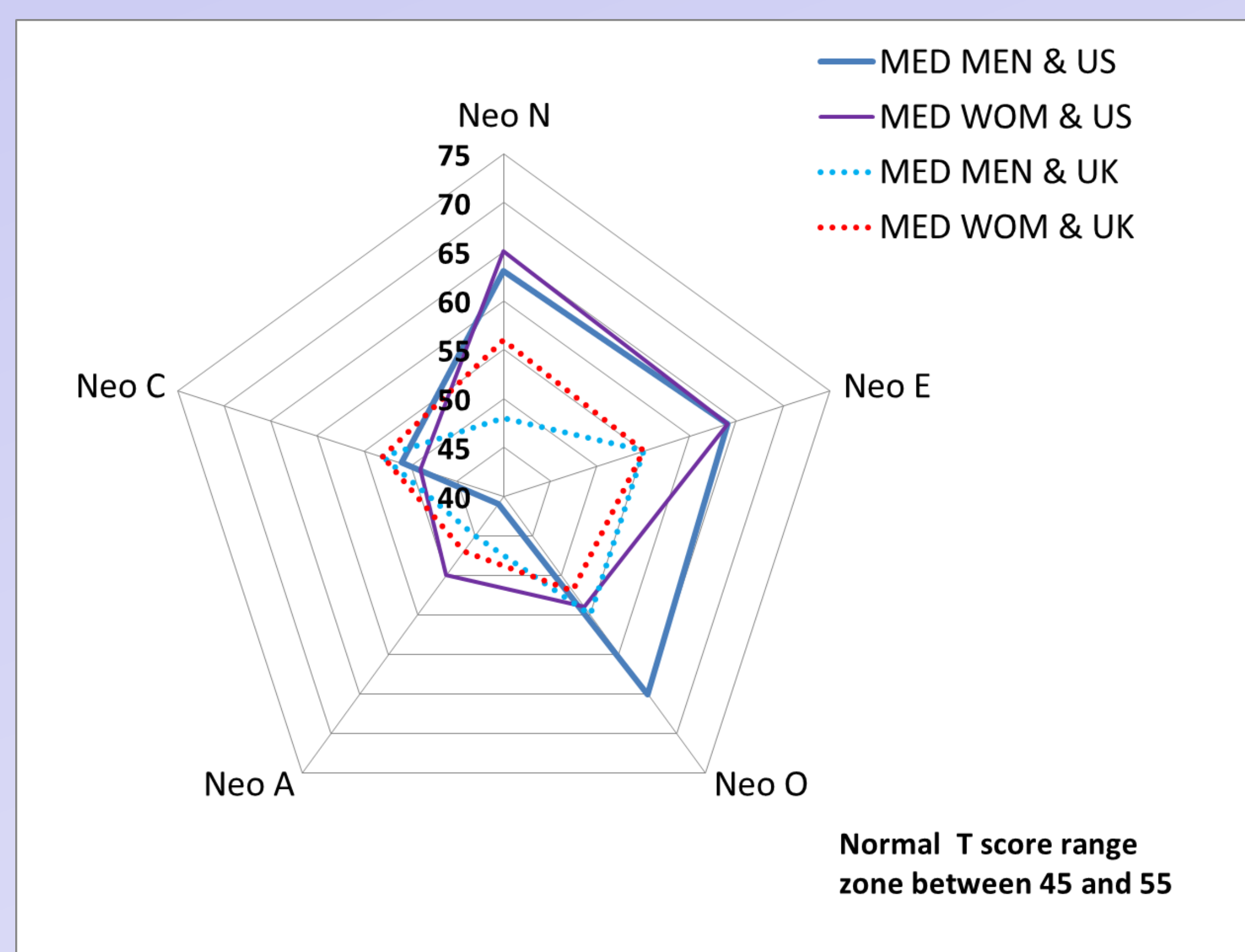
Individual differences by Faculty and Gender

Table 4 : ANOVAs by Faculty, Gender , Faculty * Gender :   *p <.05, **p <.01. ***p <.001.

	Medicine		Human Science		Psychology		Faculty	Gender	Fac x Gen
	Men	Women	Men	Women	Men	Women			
	(n=110)	(n=217)	(n=88)	(n=67)	(n=25)	(n=151)	ANOVA's	ANOVA's	ANOVA's
Variables	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)			
High School GPA	79.4 (10.7)	80.4 (10.7)	72.3 (19.1)	78.4 (9.1)	75.0 (8.4)	77.1 (11.0)	**	**	ns
Deep approach	33.6 (7.0)	32.2 (6.1)	28.1 (6.2)	29.0 (4.0)	28.7 (4.5)	28.0 (6.0)	***	ns	ns
Surface approach	21.5 (6.5)	22.9 (5.6)	24.7 (5.8)	24.6 (4.5)	27.8 (6.2)	24.2 (5.6)	***	ns	**
Neuroticism	17.6 (7.7)	24.2 (8.6)	-	-	21.6 (8.4)	24.6 (8.6)	*	***	ns
Extraversion	28.0 (5.5)	29.0 (5.3)	-	-	27.2 (5.5)	29.3 (6.3)	ns	*	ns
Openness	30.8 (6.0)	28.9 (6.4)	-	-	28.3 (6.8)	28.6 (5.7)	ns	ns	ns
Agreeableness	28.1 (6.5)	29.6 (4.7)	-	-	30.0 (4.2)	31.4 (4.4)	**	*	ns
Conscientiousness	33.7 (7.8)	33.9 (6.6)	-	-	28.5 (6.7)	29.1 (7.3)	***	ns	ns
Motivation x study	5.3 (1.0)	5.2 (0.9)	-	-	4.1 (1.4)	3.8 (1.7)	***	ns	ns
Motivation intrinsic	4.3 (1.1)	4.5 (1.2)	-	-	4.2 (1.0)	4.2 (1.3)	ns	ns	ns
Motivation extrinsic	3.7 (0.9)	3.6 (0.9)	-	-	3.9 (0.9)	3.6 (1.0)	ns	ns	ns
Motivation x care	5.0 (1.0)	5.4 (1.0)	-	-	4.6 (0.9)	4.5 (1.2)	***	ns	ns

Contribution of cognitive and non-cognitive features to first year grades by gender

Table 5 : Regressions of Gender, HS GPA; SPQ, NEO, MOTIVATIONS on first year exam grades

First year medical exam grades, p<.01:
Mean grades score men = 61.11, sd 18;
Mean grades score women = 56.52, sd 15

R square: 0.324, p<.0001.   **Medicine**

	Beta	t	Sig.
Constant		0.441	ns
HS GPA	.342	4.909	.000
Deep approach	-.042	-.503	ns
Surface approach	-.042	-.467	ns
Neuroticism	.100	.933	ns
Extraversion	-.026	-.355	ns
Openness	.222	3.021	.005
Agreeableness	-.085	-1.235	ns
Conscientiousness	.197	2.431	.002
Motivation x study	.021	.265	ns
Motivation intrinsic	.046	.570	ns
Motivation extrinsic	-.046	-.637	ns
Motivation care	-.094	-1.162	ns
Gender	-.248	-3.162	.002

Table 6 : Regressions of HS GPA; SPQ, NEO, MOTIVATIONS on first year medical exam grades by Gender

R square Men: 0.287,p<.0.001
R square Women: 0.295,p<.0.001

	Men			Women		
	Beta	t	Sig.	Beta	t	Sig.
Constant		1.105	ns		-.975	ns
HS GPA	.612	2.402	.01	.345	4.658	.001
Deep approach	.045	.414	ns	.024	.414	ns
Surface approach	.042	.370	ns	.032	.370	ns
Neuroticism	.177	.888	ns	.120	.768	ns
Extraversion	.083	.846	ns	.043	.488	ns
Openness	.574	2.117	.03	.159	1.666	ns
Agreeableness	-.545	-2.035	.04	-.058	-.632	ns
Conscientiousness	.032	.297	ns	.479	2.057	.003
Motivation x study	.056	.584	ns	.056	.584	ns
Motivation intrinsic	.202	1.981	ns	.102	.981	ns
Motivation extrinsic	-.018	-.192	ns	-.018	-.192	ns
Motivation x care	-.056	-.557	ns	-.672	-2.094	.001

V. CONCLUSIONS

Compared with general UK and US norms , medical students are more open and extrovert but less agreeable.

Undergraduates' cognitive and non cognitive profiles differ by University school. Medical students have higher previous high school GPA; they are more deep learners, conscientious and motivated in study and in caring; Psychology students are more surface learners, unstable but agreeable. Gender modulate those profiles.

The best predictor of first semester medical school MCQ exam grade is students' previous high school grade; just few non-cognitive measures contribute to such prediction i.e. openness and conscientiousness.

Men perform better than women. Gender differences in students' profiles predicting first year of medical school exam grades: for men high openness and low agreeableness; for women high conscientiousness and low motivation for care.

Need further data to confirm those first year medical school students profiles and <u>gender differences</u>. This could be helpful to better understand and eventually improve actual undergraduate selection methods.

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