The NEO-FFI in a Swiss context: psychometric properties in a sample of undergraduate medical students

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ABSTRACT

558 first year medical students completed NEO FFI in a collective setting. NEO FFI presented moderate to high internal consistency. 5 factors structure was confirmed but some items notably Agreeableness and Extraversion ones showed weak and shared factor loading.

BACKGROUND

Recent studies in medical education recommend personality measures to be used as full admission criteria for medical school entrance (Doherty, 2013, Hojat, 2014).

NEO-PI and, to a lesser extent, NEO-FFI have been used in many medical education studies. However, skepticism persists about NEOs methodological validity and reliability (Siu et al., 2010).

GOAL

to explore NEO-FFI internal consistency and factorial stability in a sample of Swiss medical students sample

METHODS

Participants: First year medical school students (N= 558), 196 males, 362 females, age mean= 22, age range (15-38)

Measures: NEO-FFI, five scales with 12 items (min :0, max: 48) : Neuroticism (N), Extraversion (E), Openness (O), Agreeableness (A), Conscientiousness (C)

Data Analysis: Dimensional scores mean and standard deviation stratified by gender following the standard NEO-FFI scoring system . Alpha reliability values and dimensions correlations . Principal components analysis with varimax rotation on the 60 NEO-FFI items. Scree test to identify components to be retained.

RESULTS

Swiss medical students & NEO-FFI dimensions scores and inter-correlations

Table 1: NEO-FFI means, SD and alpha reliabilities for 558 Swiss medical students stratified by gender

Dimension/Mean±SD	All	Males	Females	ANOVA	Alpha reliability
Neuroticism	21.9 ± 8.7	18.9 ± 8.6	23.5 ± 8.4	0.001	0.75
Extraversion	30.3 ± 5.5	30.0 ± 5.6	30.4 ± 5.5	0.361	0.63
Openness	29.4 ± 6.2	29.3 ± 6.0	29.5 ± 6.3	0.679	0.65
Agreeableness	29.3 ± 4.8	28.9 ± 4.7	29.5 ± 4.8	0.163	0.62
Conscientiousness	33.9 ± 6.7	33.1 ± 6.5	34.4 ± 6.9	0.042	0.82

Table 2 : Intercorrelations (Pearson's *r*) between NEO-FFI trait scores (n =558)

	N	E	O	A	C
N	1	-0.268*	-0.003	-0.065	-0.153
E		1	0.089	0.233*	0.244*
O			1	0.019	-0.064
A				1	0.116
C					1

* = p < 0.01 (two-tailed test)

- Females scores significantly higher than males on N and C dimensions. **C and N are highly reliable** (alpha > 0.70). **E, O, A are moderately reliable** (alpha > 0.60); **Table 1**.
- **Three significant but weak correlations** (r <0.30) within NEO-FFI dimensions : **N negatively correlated with E, A positively correlated with E and C; Table 2** .

Swiss medical students & NEO-FFI factors

Table 3: Factor-analysis of the first five varimax extracted after 19 iterations from analysis of the NEO-FFI in 558 swiss medical students

PCA (KMO 0.82, p< .001)	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
% Variance Explained	13.1	8.6	6.7	5.6	3.4
Item					
N1	0.64	0.20	0.03	0.04	-0.08
N2	0.70	-0.07	0.07	-0.02	-0.04
N3	0.68	0.00	0.16	-0.12	-0.03
N4	0.64	-0.04	-0.15	0.12	0.03
N5	0.80	0.08	0.02	-0.03	0.09
N6	0.67	-0.20	-0.01	0.04	-0.05
N7	0.79	0.09	0.01	0.04	0.02
N8	0.40	0.04	-0.28	-0.14	0.28
N9	0.68	-0.20	0.02	-0.21	-0.06
N10	0.68	-0.02	-0.19	0.05	-0.01
N11	0.57	-0.23	0.00	-0.14	-0.05
N12	0.47	-0.08	-0.06	-0.07	-0.02
C1	0.10	0.59	0.06	-0.05	-0.09
C2	-0.22	0.64	-0.17	0.05	-0.04
C3	0.00	0.69	-0.10	-0.04	-0.10
C4	0.08	0.54	0.29	0.10	0.04
C5	-0.05	0.69	0.02	-0.08	0.25
C6	-0.16	0.67	-0.04	-0.02	-0.09
C7	-0.01	0.65	0.15	0.11	0.10
C8	-0.06	0.58	0.19	0.19	0.24
C9	-0.16	0.30	0.25	-0.07	-0.01
C10	-0.11	0.72	0.11	0.04	0.03
C11	-0.18	0.67	-0.13	-0.02	-0.09
C12	0.02	0.48	-0.07	0.19	0.26
A1	0.01	0.13	0.57	0.04	0.01
A2	-0.20	0.02	0.41	-0.10	-0.29
A3	-0.03	0.13	0.47	-0.20	-0.30
A4	0.13	-0.03	0.48	0.06	-0.11
A5	-0.08	0.14	0.54	0.05	-0.33
A6	-0.14	0.05	0.31	0.13	-0.21
A7	-0.25	0.10	0.38	-0.08	0.06
A8	-0.03	0.05	0.61	-0.10	-0.23
A9	-0.12	-0.14	0.17	-0.10	-0.45
A10	0.13	0.21	0.61	0.08	0.06
A11	0.02	0.03	0.11	0.14	-0.43
A12	-0.12	-0.12	0.43	-0.09	-0.47
O1	0.01	-0.35	-0.14	0.19	-0.18
O2	0.01	-0.38	-0.09	0.15	-0.30
O3	0.04	-0.07	-0.01	0.62	-0.08
O4	-0.09	0.00	0.06	0.45	-0.08
O5	0.07	0.08	0.14	0.70	0.07
O6	-0.13	0.06	0.17	0.37	0.03
O7	0.45	-0.03	0.22	0.10	-0.02
O8	0.01	0.08	-0.20	-0.08	0.01
O9	0.07	0.00	0.05	0.78	0.00
O10	0.07	-0.06	0.04	0.57	-0.02
O11	-0.16	0.23	-0.01	0.60	0.15
O12	-0.18	-0.06	-0.17	0.66	0.11
E1	0.10	0.07	0.35	-0.01	0.24
E2	-0.14	-0.06	0.45	0.08	0.32
E3	-0.11	-0.01	0.35	0.02	0.17
E4	0.03	0.14	0.56	0.19	0.31
E5	-0.10	0.11	0.03	0.04	0.58
E6	-0.04	-0.16	0.37	-0.03	-0.03
E7	-0.47	0.21	0.22	0.12	0.30
E8	-0.23	0.13	0.59	-0.02	0.38
E9	-0.48	0.16	0.23	0.10	0.05
E10	0.01	0.03	0.13	0.03	0.45
E11	-0.20	0.24	0.26	0.06	0.40
E12	-0.18	0.07	0.03	0.07	0.37

— PCA extracted 15 factors with eigenvalues > 1, which explained a total of 61.6 % of observed variance in the NEO-FFI. Scree test suggests that **the first five factors (37.9% of the explained variance) represents the main sources of variance in the NEO-FFI data matrix; Table 3.**

— **Factor 1 and Factor 2 are clearly N and C** with all items loading highly and positively on the factors.

— **Factor 3 contains ten of the twelve A items.**
  - Two of them, A5 and A12, load also negatively on Factor 5.
  - A9 and A11 load negatively only on Factor 5.

— **Factor 4 contains eight of the twelve O items.**
  - O1 and O2 load negatively on Factor 2 . O7 loads positively on Factor 1.
  - O8 does not load on any dimension within the current five-factor solution.

- **Factor 5 contains eight of the twelve E items.**
  - Four of them load also and higher on other factors: E2, E6 and E8 load positively on Factor 3, E7 loads negatively on Factor 1
  - E1, E3, E6 and E9 load positvely on Factor 3 only.

DISCUSSION

- **Known sex differences recovered** even if less marked than in other studies (Egan, 2000). This might due to females medical students specific characteristics.
- **NEO-FFI met acceptable standards** of reliability and validity as well as internal consistency and factorial stability as in previous studies (Aluja, et. al, 2005)
- **N and C scales** seem to measure the latent traits they are supposed to, **A, O, E not completely**.
- **E is the more questionable scale**: its items variance splits amongst other factors, notably Factor 3 (A). E problematic items belong mainly to Positive emotions and Gregariousness NEO E facets.

CONCLUSIONS

- **The use NEO-FFI can be used as a personality measure instrument in medical education as a rapid and shorter alternative to 240 items NEO PI-R.**
- **Gender has to be considered in data collection.**
- **Analyses at the item level suggest that O, A and E scales of the NEO-FFI require some modifications and caution in use and interpretations**
- **Further findings are needed about NEO-FFI stability.**

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