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General Hospital Psychiatry

Letter to the editor

Association between the Big Five factors of personality and survival seven years after heart transplantation

1. Introduction

Over the past decades, many studies have tried to search psychosocial predictors of survival after heart transplantation (HT), independent of the recipient's cardiac characteristics and risk factors [1–4]. Although some personality traits are well-known predictors of posttransplant clinical outcomes, the lack of empirical findings considerably limits the evidence about its real impact on mortality [5]. The objective of this study was to perform an exploratory analysis to investigate the relationship between the Big Five factors of personality and long-term survival in HT recipients.

2. Methods

We performed a prospective study that included consecutive adult candidates who underwent HT at the University Clinical Hospital of Barcelona from January 2006 to December 2012. HT recipients were followed-up until May 2018 (maximum observation period of 12 years). The study protocol was approved by the Ethical Committee Board of the hospital. Prior to the surgery, we applied the Structured Clinical Interview for DSM-IV axis I and axis II disorders, Clinician Version (SCID), and the Hospital Anxiety and Depression Scale (HADS) for the evaluation of psychopathology. The Apgar-Family questionnaire was used to determine family function. For the personality assessment, we used the Spanish validation of the Five Factors Inventory Revised (NEO-FFI-R) [6]. It is a self-report questionnaire with 60 items that measures the Big Five main personality factors: Neuroticism, Extraversion, Openness to experience, Agreeableness and Conscientiousness. Since

there are no generally accepted cut-off points for NEO-FFI-R, we dichotomized each personality factor using the mean scores obtained in the Spanish validation [6]. For the statistical methods used to evaluate each personality factor as a predictor for post-HT survival, we conducted the Cox proportional hazard regression analysis to test multivariate associations with time until death. This analysis was adjusted to consider the main medical and psychosocial variables. The Kaplan–Meier survival analysis was performed for each dichotomized personality factor separately, comparing the HT recipients with either low or high scores and using the Log-Rank (Mantel-Cox) chi-square test to check differences between survival curves.

3. Results

We included 78 adult HT recipients in the follow-up study protocol. The baseline characteristics of this sample were published in a previous paper [7]. The mean follow-up after HT was 7 years (SD = 3.52 and range 0–12.33 years), and at the end of this period, 53 recipients were alive (68%) and 25 had died (32%). The mean scores of each personality factor were: 20.47 (SD = 7.66) for Neuroticism, 28.06 (SD = 6.20) for Extraversion, 29.53 (SD = 7.07) for Openness to Experience, 34.28 (SD = 6.04) for Agreeableness and 35.02 (SD = 6.19) for Conscientiousness. In the multivariate analysis, only Agreeableness was independently associated with survival (Table 1). This result was consistent with the Kaplan–Meier analysis (Fig. 1, Supplementary data) that showed that lower scores in Agreeableness were significantly associated with an increased risk of death, as indicated by the results of the Log-Rank chi-square test: $\chi^2 = 4.83$, df = 1, $p = 0.029$.

Table 1

Cox Proportional-Hazard Ratios for pre-HT recipient characteristics, the Big Five factors of personality measured with NEO-FFI-R, and time until death (n = 78).

	Neuroticism		Extraversion		Openness to experience		Agreeableness		Conscientiousness	
	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value
Main factor[a]	0.33 (0.04–2.89)	0.316	1.12 (0.4–4.16)	0.829	0.45 (0.08–2.43)	0.355	0.11 (0.01–0.71)	0.021	0.47 (0.12–1.85)	0.282
Illness duration before HT (years)	0.86 (0.76–0.97)	0.016	0.79 (0.67–0.93)	0.004	0.85 (0.75–0.95)	0.006	0.82 (0.72–0.94)	0.004	0.85 (0.76–0.96)	0.009
Male sex	1.5 (0.34–6.61)	0.592	0.94 (0.2–4.39)	0.94	1.63 (0.37–7.26)	0.519	1.91 (0.43–8.52)	0.396	1.19 (0.3–4.72)	0.809
Ejection fraction (%)	0.99 (0.93–1.05)	0.709	0.99 (0.92–1.06)	0.765	0.98 (0.93–1.05)	0.633	0.99 (0.92–1.05)	0.671	0.98 (0.91–1.04)	0.477
Pulmonary Vascular Resistance (UW)	1.19 (0.6–2.36)	0.626	1.36 (0.71–2.6)	0.356	1.32 (0.6–2.9)	0.486	1.41 (0.76–2.58)	0.273	1.14 (0.59–2.2)	0.686
Pulmonary Artery Pressure (mmHg)	1 (0.93–1.07)	0.997	0.99 (0.93–1.07)	0.953	0.99 (0.92–1.07)	0.833	0.99 (0.92–1.07)	0.866	1 (0.94–1.07)	0.924
Creatinine (mg/dL)	1.57 (0.75–3.25)	0.228	2.02 (0.85–4.79)	0.112	1.51 (0.74–3.07)	0.257	2.54 (0.98–6.59)	0.054	1.41 (0.69–2.88)	0.347
AST/ALT ratio	2.53 (1.07–5.95)	0.034	2.18 (1.03–4.6)	0.042	1.96 (0.91–4.23)	0.088	3.44 (1.35–8.78)	0.01	2.01 (0.97–4.16)	0.06
DSM-IV diagnosis	1.12 (0.24–5.26)	0.888	1.17 (0.26–5.21)	0.837	1.36 (0.27–6.87)	0.706	1.81 (0.39–8.45)	0.453	1.09 (0.22–5.27)	0.915
HADS total score	1.03 (0.21–5.16)	0.971	0.26 (0.05–1.35)	0.109	0.43 (0.08–2.37)	0.33	0.49 (0.11–2.19)	0.353	0.54 (0.12–2.42)	0.419
Apgar-Family questionnaire score	1.62 (0.35–7.56)	0.539	1.5 (0.33–6.79)	0.6	1.30 (0.3–5.67)	0.726	1.03 (0.23–4.54)	0.965	1.33 (0.31–5.8)	0.702

ALT = Alanine Transaminase; AST = Aspartate Transaminase; CI = Confidence Interval; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, 4th Edition; HADS = Hospital Anxiety and Depression Scale; HR = Hazard Ratio; HT = Heart Transplantation.

[a] Main factor refers to Neuroticism, Extraversion, Openness to experience, Agreeableness and Conscientiousness, respectively.

4. Discussion

This is the first study to investigate the relation between the Big Five factors of personality and long-term survival in HT recipients. Our results suggest that higher levels of Agreeableness may be independently associated with better clinical outcomes and post-HT survival. Previous investigations, that are in accordance with our results, demonstrated a relationship between high Agreeableness and both a lower level of clinical disorders and higher optimism [8,9]. Likewise, there is growing evidence linking positive psychological characteristics, like optimism and resilience, to better health outcomes, and in the last years, optimism-specific interventions for people with cardiovascular disease have been developed [10]. In contrast with the results obtained by Stilley et al. (2004), which showed a prevalence of 33% of personality disorders among cardiothoracic transplant recipients according to the Five-Factor model, the mean scores of NEO-FFI-R of our sample were similar to those of the general population [5]. Regarding the other four personality factors, the typical pattern linked to clinical disorders are high Neuroticism, low Conscientiousness, and low Extraversion, but these factors were not associated with long-term survival in our study [8]. This finding may be explained by the exhaustive pre-transplant selection criteria, which might generate personality traits among our sample that are highly homogenous. The main limitations of our study are that we have performed an exploratory analysis based in only 25 deaths, there are multiple comparisons and a more conservative analysis would use $p = 0.01$ as significant. Based on our results, we postulate that adaptive personality traits such Agreeableness could establish a construct opposite of Type A behavior or a vulnerability to disease model, play a role as a protective factor and a long-term survival predictor in HT recipients, and provide a valuable target for new therapeutic strategies.

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