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Differences Between Individual and Societal Health State

Valuations:

Any Link With Personality?

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Abstract

Objective—The concept of “adaptation” has been proposed to account for differences between individual and societal valuations of specific health states in patients with chronic diseases. Little is known about psychological indices of adaptational capacity, which may predict differences in individual and societal valuations of health states. We investigated whether such differences were partially explained by personality traits in chronic disease patients.

Research Design—Analysis of baseline data of randomized controlled trial.

Subjects—Three hundred seventy patients with chronic disease.

Measures—The NEO-five factor inventory measure of personality, EuroQoL-5D (EQ-5D) societal-based, and the EQ visual analogue scale individually-based measures of health valuation.

Results—Regression analyses modeled D_{ev} , a measure of difference between the EQ-Visual Analogue Scale and EQ-5D, as a function of personality traits, sociodemographic factors, and chronic diseases. Individual valuations were significantly and clinically higher than societal valuations among patients in the second and third quartile of conscientiousness ($D_{ev} = 0.08$, $P = 0.01$); among covariates, only depression ($D_{ev} = -0.04$, $P = 0.046$) was also associated with D_{ev} .

Conclusion—Compared with societal valuations of a given health state, persons at higher quartiles of conscientiousness report less disutility associated with poor health. The effect is roughly twice that of some estimates of minimally important clinical differences on the EQ-5D and of depression. Although useful at the aggregate level, societal preference measures may systematically undervalue the health states of more conscientious individuals. Future work should examine the impact this has on individual patient outcome evaluation in clinical studies.

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Keywords

societal health status valuations; EuroQoL-5D; EuroQoL visual analogue scale; personality traits; Chronic Disease Self-Management Program

Preference-based health status measures assess health in a rational and normative way by assigning values to particular health states, based on community or societal preferences for some health states over others.¹ The use of societal preferences provides a standard metric for assessing health status, and ultimately gains in health utility associated with one intervention versus another. Such assessments form the basis for cost-effectiveness analysis and according resource allocation.² The EuroQoL-5D (EQ-5D)^{1,3} is a preference-based health status measure widely used across different patient groups⁴⁻⁶ and nations,⁷⁻¹⁰ based on weights representing population average perceptions of the desirability of a given health state.^{1,7,11} A companion measure, the EuroQoL visual analogue scale (EQ VAS),³ by contrast, yields a valuation for an individual's health state based simply on that individual's opinion.

Broadly speaking, the 2 methods assess the same underlying construct—health status. However, the manner in which they numerically value health status differs in important ways. While the EQ-5D is a true societal-based preference measure (with valuations based on a time trade-off technique, and thus involving uncertainty), the VAS simply asks people to rate their health status on a 0 to 100 scale. Transformations are available to make the scaling of EQ-5D and VAS more similar. Empirically, however, studies suggest that the 2 approaches yield comparable valuations of health status when used to rank health conditions. Our underlying assumption is that EQ-5D scores reflect more society-based valuations and that VAS scores reflect more personal valuations. Furthermore, we assume that these 2 sets of valuations may differ for a given health state. The current study explores 1 factor potentially responsible for such differences—patient personality.

A measure of deviation, D_{ev} , has been developed to ascertain the magnitude of differences between individual and societal valuations of a given health state.¹² D_{ev} is equal to the difference between an individual's subjective perception of their health status—in this study, measured by the VAS—and the EQ-5D society-based preference score for that individual's health state. If D_{ev} is positive, individuals tend to perceive their own health status as better than members of the broader society believe that health status would be. If D_{ev} is negative, the reverse is true. A similar approach has recently been employed by Gaskin and Frick.¹³

The differences in individual and societal valuations captured by D_{ev} have largely been attributed to adaptation processes associated with chronic disease. However, little is understood about psychological characteristics associated with this adaptation phenomenon. Personality traits index adaptive capacities, and may influence differences between individual and societal preferences. One such set of characteristics may be the Five Factor Model (FFM) personality traits of neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness, which represent the primary dimensions of individual variation in cognitive, behavioral, and emotional tendencies^{14,15} and are associated with health and mortality to a degree comparable to socioeconomic status and intelligence.¹⁶ Based on previous studies,¹⁷⁻²² we hypothesized that patients with chronic disease with higher levels of conscientiousness and lower levels of neuroticism would show individual health valuations significantly higher than societal valuations of their health states (ie, positive values of D_{ev}).

METHODS

Participants and Procedure

Our sample consisted of patients with chronic disease enrolled in a randomized controlled trial of the Homing in on Health Program, an adaptation of the Chronic Disease Self Management Program^{23,24} designed to improve self-management of chronic conditions and health status (approved by the local Institutional Review Board). Patients aged 40 and older were recruited from family physician and general internist practices in a university-affiliated primary care network located in Northern California. Inclusion criteria were one or more of the following chronic illnesses: arthritis, asthma, chronic obstructive pulmonary disease, congestive heart failure, depression, and/or diabetes mellitus; ability to speak and read English; residence in a private home with an active telephone; adequate eyesight and hearing to participate via telephone and read study materials; and at least 1 basic activity impairment, as assessed by the Health Assessment Questionnaire,²⁵ or a score of 4 points or greater (suggestive of clinically significant depressive symptoms exerting impairment) on the 10-item version of the Center for Epidemiologic Studies Depression Scale.²⁶ The present analysis focused on baseline data.

Measures

FFM Personality Factors—At baseline, subjects completed the 60-item NEO-five factor inventory²⁷ an extensively validated abbreviated version of the NEO Personality Inventory-Revised. The scales in this measure tap the FFM personality factors: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. Cronbach- α for the 5 scales ranged from 0.70 to 0.87. Personality traits were scaled in quartiles to facilitate examination of nonlinear relationships.

Self-Rated Health—At baseline, subjects also completed 3 self-rated health measures. The first was the 5-item EQ-5D descriptive system.³ Subjects rated their problems with mobility, self-care, usual activities, pain/discomfort, and anxiety/depression as on the day of assessment, using a 3 category scale (no problems, some problems, extreme problems). Each subject's responses were summed and then converted into a summary index (EQ-5D index) by applying scores from a population-based US valuation set.¹¹ Though the minimal clinically important difference in EQ-5D score remains somewhat controversial, various investigators have suggested values ranging from 0.03²⁸ to 0.07 points,¹³ with some suggesting values as high as 0.1 points.^{29,30} Second, subjects also completed the EQ VAS.³ Subjects indicated their overall health as of the day of assessment from 0 (worst imaginable health state) to 100 (best imaginable health state), with values rescaled to 0 to 1. Some studies^{31,32} suggests that the VAS functions to some extent like a preference measure subjects also completed the Medical Outcome Study SF-36,³³ a well-validated nonpreference-based health status measure, from which we derived Mental Component Summary and Physical Component Summary (MCS-36 and PCS-36) scores. The SF-36 was used as an additional covariate in secondary analyses.

Analyses

All analyses were conducted using Stata, version 10.0 (StataCorp, College Station, TX). D_{ev} was defined as (EQ VAS-EQ-5D) scores. We examined the effect of patient neuroticism and conscientiousness on D_{ev} , controlling for all other personality traits and age, gender, educational status (high school or less vs. greater than high school), minority status (minority or non-Hispanic white), and the study chronic conditions (a series of dummy variables). Secondary analyses also adjusted for the SF-36, applied a power transformation to the EQ-VAS to produce a distribution similar to the EQ-5D,³⁴ examined whether personality effect varied across chronic conditions sufficient prevalent for examination (diabetes, depression, arthritis), and examined personality association with EQ-5D and VAS scores separately.

RESULTS

Table 1 provides a summary of subjects' baseline characteristics. Of the 415 patients enrolled, nearly all (94%, or 384) completed the NEO-five factor inventory, 397 completed the EQ-5D and EQ VAS, and 370 had complete data on all variables. Neuroticism was not associated with D_{ev} , but conscientiousness showed a significant effect at the second and third quartiles, and approached significance at the fourth, presented in Table 2. Movement from the first to second or third quartile of conscientiousness was associated with a 0.08 increase in D_{ev} , while the highest quartile was associated in valuation of one's health state 0.05 greater than societal preferences. Among covariates, only depression was significant ($B = -0.04$, $P = 0.045$). Adjustment for MCS-36 and PCS-36 scores did not appreciably diminish the effect of conscientiousness on D_{ev} . Analyses based on power-transformed VAS scores produced highly comparable results, and interaction terms suggested no differential effect of personality across depression, diabetes, or arthritis. Including all personality variables with all covariates in the same model for D_{ev} , conscientiousness exerted virtually identical effects, with no effect for depression ($P > 0.20$). Finally, neuroticism was associated with worse health status on both the VAS and EQ-5D separately, whereas conscientiousness was associated with better health status on the EQ-5D.

DISCUSSION

The concept of adaptation has been offered to explain prior reports that individual health valuations deviate from societal valuations in chronic disease patients, yet psychological characteristics indexing this adaptational capacity³⁵ remain unknown.^{12,13} We investigated the effect of personality on a measure of individual deviation from societal valuations of a particular health state, D_{ev} .¹² After controlling for a number of potential confounds, chronically ill patients with levels of conscientiousness in the middle 2 quartiles place greater value on their health than normative based societal preferences would suggest. These effects were more than 4 times the effect of most chronic conditions³¹ and exceed most thresholds for clinical significance, as did the trend for the highest quartile. The conscientiousness effect was the only significant systemic effect observed among all the covariates apart from that associated with self-reported depression; the conscientiousness effect was approximately twice that of self-reported depression. These considerations suggest that persons of higher conscientiousness experience less disutility at poor health states, at a clinically meaningful level. The effects of conscientiousness, neuroticism, and extraversion on the EQ-5D and VAS were larger even than their effect on D_{ev} , also suggesting the importance of personality for both personal and societal preference scores.

Why more conscientious individuals value their particular health state more highly than do societal norms? Persons higher in conscientiousness are more goal-oriented and self-controlled,²⁷ adherent to medical treatment,³⁷ invested in adopting healthful behaviors,³⁸ cautious in their estimation of health risks,³⁹⁻⁴¹ less likely to self-handicap⁴² or report hypochondriacal symptoms.^{43,44} Such individuals also have less medically documented illness burden⁴⁵ and lower all-cause mortality risk.⁴⁶ Thus conscientiousness may be associated with D_{ev} due to thought, perception, and health status itself.

In secondary analyses, higher conscientiousness also affected VAS scores. Neuroticism was associated with worse absolute health status on both measures. However the individual health evaluations made by more neurotic patients were not appreciably worse than those based on societal norms, because such patients report poor health comparably across measures. These analyses also suggest that personality may affect the EQ-5D directly.

One implication of this finding is that because adaptation is connected to specific personality tendencies, preference-based measures may systematically undervalue the health of individuals with those tendencies. Time trade-off or standard gambles inspired by the framework of von Neumann and Morgenstern and used for health state valuations essentially rely on personal preferences, and thus may be inherently tied to personality effects. However, to gauge whether cost-effectiveness analysis of clinical studies produce less meaningful utility estimates for certain types of patient groups such as the conscientious, study of under- or over-valuation of change in health status is required. If links between D_{ev} and factors such as personality can be elucidated, they can be explicitly incorporated into analyses employing societal preference-weighted health status measures, potentially improving their validity and applicability to individuals.

Findings must be interpreted in light of balanced assessment of study strengths and limitations. Although the focus on chronic disease patients was strength, it also represents the limiting frame of generalizability. Also, the decision to participate in a research study is likely affected by the personality profile of the potential subject, and involved a particular geographic area and chronic conditions. Future work might investigate this phenomenon in other regions and patient groups. The measures we used were among the most common, however, maximizing relevance of the study. To the extent that the EQ-5D is informed by individual as well as societal preferences, it is likely that the D_{ev} under-estimates the true difference between personal and societal valuations of a given health state. Additionally, the EQ-5D is based on time trade-off, while the EQ-VAS is not, and/or may incorporate health information not reflected in the EQ-5D. However, this is a common issue,^{34,47} and findings proved robust in sensitivity analyses with a power transformation approximating the time trade-off distribution. Finally, D_{ev} should be investigated in the context of specific chronic diseases, and outside the context of chronic disease management programs.

In conclusion, conscientiousness appears to be the personality factor responsible for differences between individual and societal valuations of health status. Controlling for other relevant factors, persons of greater conscientiousness report less disutility from poor health states than the societal valuations of these health states used in reference case analysis. Future consideration of the role of personality in outcome evaluation of patients in clinical research studies appears warranted.

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TABLE 1

Characteristics of Participants

	Home	Telephone	Usual Care Control
Characteristic	(N = 138)	(N = 139)	(N = 138)
Age, yr, mean (SD)	59.8 (11.2)	61.2 (11.6)	60.1 (11.7)
Gender, number (%)			
Female	108 (78)	109 (78)	104 (75)
Male	30 (22)	30 (22)	34 (25)
Race/ethnicity, number (%)			
Nonhispanic white	103 (75)	110 (79)	115 (83)
Black	20 (15)	11 (8)	15 (11)
Hispanic	8 (6)	5 (4)	5 (4)
Asian	4 (3)	5 (4)	2 (1)
Pacific Islander	2 (1)	4 (3)	0 (0)
Declined to answer	1 (1)	4 (3)	1 (1)
Education level, number (%)			
Nonhigh school graduate	1 (1)	2 (1)	4 (3)
High school graduate	18 (13)	18 (13)	18 (13)
Some college	53 (38)	50 (36)	58 (32)
College graduate	42 (30)	41 (30)	39 (28)
Any postgraduate education	24 (17)	24 (17)	18 (13)
Declined to answer	0 (0)	4 (3)	1 (1)
Income level, number (%)			
<20,000	20 (15)	19 (14)	19 (14)
20,000-39,999	21 (15)	23 (17)	25 (18)
40,000-59,999	24 (17)	15 (11)	19 (14)
60,000-79,999	18 (13)	22 (16)	24 (17)
80,000-99,999	6 (4)	9 (7)	9 (7)
>100,000	16 (12)	18 (13)	13 (19)
Declined to answer	33 (24)	33 (24)	29 (21)
Marital status, number (%)			
Married	79 (57)	79 (57)	76 (55)
Widowed	14 (10)	15 (11)	19 (14)
Divorced	31 (23)	30 (22)	35 (25)
Never married	14 (10)	12 (9)	7 (5)
Declined to answer	0 (0)	3 (2)	1 (1)
Personality traits (raw score)			
Neuroticism	21 (10)	22 (9)	22 (10)
Extraversion	26 (8)	26 (7)	26 (8)
Openness	28 (7)	29 (6)	29 (6)
Agreeableness	34 (5)	33 (6)	33 (6)
Conscientiousness	32 (8)	32 (6)	32 (7)
Chronic conditions, number (%)			
1	55 (40)	72 (51)	43 (31)

	Home	Telephone	Usual Care Control
2	51 (37)	40 (29)	65 (47)
3	18 (13)	21 (15)	21 (15)
≥4	14 (10)	6 (4)	9 (7)
Specific study diagnoses, number (%) [*]			
Arthritis	83 (60)	73 (52)	77 (55)
Depression	59 (43)	64 (46)	70 (51)
Diabetes	64 (46)	50 (36)	58 (42)
Asthma	34 (25)	25 (18)	39 (28)
COPD	15 (11)	11 (8)	17 (12)
CHF	17 (12)	17 (12)	14 (10)
Uninsured, number (%)	3 (2)	5 (4)	2 (2)
Personality factors, mean (SD)			
Neuroticism	20.6 (9.9)	22.1 (8.9)	21.9 (9.6)
Extraversion	25.9 (8.0)	26.1 (6.9)	25.9 (7.6)
Openness	28.2 (6.6)	28.6 (6.3)	28.9 (6.3)
Agreeableness	34.4 (4.8)	33.3 (5.6)	33.3 (5.7)
Conscientiousness	31.3 (7.5)	32.0 (6.4)	31.9 (6.7)
Self-rated health, mean (SD)			
EQ-5D	0.74 (0.18)	0.73 (0.18)	0.75 (0.16)
EQ-VAS	64.3 (18.5)	66.6 (19.1)	68.4 (18.6)

* Percentages exceed 100 because many participants had more than 1 condition. SD indicates standard deviation; COPD, chronic obstructive pulmonary disease; CHF, coronary heart failure.

TABLE 2
Adjusted Personality Predictors of D_{ev} , VAS, and EQ-5D

	D_{ev}				VAS				EQ-5D			
	Parameter Estimate	95% Confidence Interval	P		Parameter Estimate	95% Confidence Interval	P		Parameter Estimate	95% Confidence Interval	P	
Neuroticism quartile												
1st	Reference				Reference				Reference			
2nd	0.01	-0.06	0.05	0.74	-0.02	-0.07	0.04	0.51	-0.03	-0.08	0.02	0.28
3rd	0.00	-0.06	0.06	0.95	-0.02	-0.08	0.04	0.55	-0.02	-0.07	0.03	0.47
4th	0.03	-0.10	0.04	0.45	-0.08	-0.15	-0.01	0.02	-0.11	-0.17	-0.05	0.00
Conscientiousness quartile												
1st	Reference				Reference				Reference			
2nd	0.08	-0.13	-0.02	0.01	0.06	0.00	0.11	0.06	-0.02	-0.07	0.03	0.40
3rd	0.08	-0.14	-0.03	0.01	0.09	0.03	0.14	0.00	0.01	-0.04	0.06	0.74
4th	0.05	-0.11	0.00	0.07	0.07	0.02	0.13	0.01	0.02	-0.03	0.07	0.39
Extraversion quartile												
1st	Reference				Reference				Reference			
2nd	-0.01	-0.05	0.07	0.70	0.03	-0.03	0.08	0.32	0.04	-0.01	0.09	0.13
3rd	-0.01	-0.04	0.07	0.63	0.03	-0.03	0.09	0.28	0.05	-0.01	0.10	0.09
4th	0.01	-0.07	0.05	0.66	0.03	-0.03	0.09	0.28	0.02	-0.04	0.07	0.49
Agreeableness quartile												
1st	Reference				Reference				Reference			
2nd	-0.02	-0.04	0.07	0.53	-0.03	-0.09	0.02	0.22	-0.02	-0.07	0.03	0.52
3rd	-0.02	-0.04	0.08	0.46	-0.01	-0.07	0.05	0.74	0.01	-0.04	0.07	0.64
4th	0.01	-0.06	0.05	0.85	-0.01	-0.06	0.04	0.63	-0.02	-0.06	0.03	0.46
Openness quartile												
1st	Reference				Reference				Reference			
2nd	0.01	-0.06	0.04	0.77	-0.02	-0.07	0.03	0.47	-0.03	-0.07	0.02	0.27
3rd	0.03	-0.09	0.02	0.26	0.01	-0.05	0.07	0.70	-0.02	-0.07	0.03	0.40
4th	0.04	-0.10	0.01	0.14	0.03	-0.03	0.08	0.31	-0.01	-0.06	0.04	0.59

Adjusted for age, gender, race/ethnicity, education level, and presence/absence of diabetes, CHF, COPD, asthma, arthritis, and depression. D_{ev} = VAS—EQ-5D. Only depression significant for D_{ev} in ($B = -0.04, P = 0.046$) VIF for model = 1.42.