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Research report

Personality and the perception of health and happiness

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ABSTRACT

Background: Health is a state of physical, mental, and social well-being. Personality traits measure individual differences in adaptive functioning and mental health, but little is known about how well personality accounts for health's affective aspects (i.e., "happiness") and its non-affective aspects (i.e., "wellness") in the general population.
Methods: 1102 volunteer representatives of the Sharon area of Israel completed the Temperament and Character Inventory (TCI), the Positive and Negative Affect Scale (PANAS), the Satisfaction with Life Scale (SWLS), the Multidimensional Scale of Perceived Social Support (PSS), and the subjective health assessment of the General Health Questionnaire (GHQ). Multidimensional personality profiles were used to evaluate the linear and non-linear effects of interactions among dimensions on different aspects of well-being.
Results: Self-directedness was strongly associated with all aspects of well-being regardless of interactions with other dimensions. Cooperativeness was strongly associated with perceived social support, and weakly with other aspects of well-being, particularly when Self-directedness was low. Self-transcendence was strongly associated with positive emotions when the influence of the other character dimensions was taken into account. Personality explained nearly half the variance in happiness and more than one-third of the variance in wellness.
Limitations: Our data are cross-sectional and self-reported, so they are subject to personal perceptual bias.
Conclusions: The emotional, social, and physical aspects of well-being are interdependent, but specific configurations of TCI Self-directedness, Cooperativeness, and Self-transcendence influence them differentially. Interactions among different combinations of character traits have strong effects on the perception of both wellness and happiness.

1. Introduction

Much is known about the relationship of personality to psychopathology (Cloninger, 1999), but much less is known about the relationship of personality to health as a state of physical, mental, and social well-being (Cloninger, 2004). Yet a mental health professional needs to understand the relationship of personality to well-being in order to help motivate both the promotion of health and the reduction of distress and disability (Amering and Schmolke, 2009; Cloninger, 2006). Health is much more than the absence of disease or infirmity, so clinicians need to understand how to promote health in all its aspects (WHO, 1946, 2001).

To proceed scientifically, we must be able to measure the distinct aspects of well-being in a reliable way. Several reliable ways of measuring well-being are available, including measures that focus on the presence of positive emotions and the absence of negative emotions, life satisfaction (Pavot and Diener, 1993), social engagement (Zimet et al., 1990), and physical wellness (Knauper and Turner, 2003). The term "subjective well-being" or "happiness" is often used to refer to a combination of the absence of negative emotions and the

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presence of positive emotions, life satisfaction, and social engagement (Ryan and Deci, 2001). Such measures of subjective well-being emphasize the importance of the hedonic aspects of experience, such as pleasure, satisfaction, and happiness (Kahneman et al., 2003). However, the identification of life satisfaction and subjective well-being with pleasure and positive emotion has been seriously challenged because people can regard themselves as well even when they are suffering, if they regard their unpleasant experience as meaningful and purposeful (Cassell, 1999; Keyes et al., 2002; Ryan and Deci, 2000; Ryff and Keyes, 1995).

The term "psychological well-being" or "eudaimonia" has been used to refer to well-being that arises from a combination of character strengths involving facets of Self-directedness (e.g. autonomy, life purpose, environmental mastery, and self-acceptance), Cooperativeness (e.g., positive relations with others), and Self-transcendence (e.g., personal growth and self-actualization) (Ryan and Deci, 2001; Ryff and Keyes, 1995; Schmutte and Ryff, 1997). Recently even those who use the term "happiness" from hedonic and positive psychology are actually describing the concept of eudaimonic well-being or "psychological wealth" in which lasting satisfaction emerges from meaningful values and goals as a process of character development (Diener and Biswas-Diener, 2008). Mature character traits are associated with eudaimonic well-being and promote both emotional and physical health (Cloninger, 2004; Ryff et al., 2004, 2006). Temperament traits, like Harm Avoidance (e.g., anxiety proneness) or Novelty Seeking (e.g., anger proneness), are associated with hedonic well-being and also have some associations with both physical and emotional health (Cloninger et al., 1998; Moldin et al., 1993). However, the association of health and "wellness" with character strengths appears to be stronger and more consistent than with temperament (Manderscheid et al., 2010; Ruini et al., 2003; Ryff et al., 2004). Likewise, recovery of quality of life often emphasizes the importance of the same character traits, even when slightly different terminology is used to emphasize the role of hope, empathy, and respect in person-centered care (Amering and Schmolke, 2009). It is remarkable that theoretically diverse approaches have converged in their substantive conclusions about how to describe a health-promoting character profile.

Despite this remarkable convergence in broad constructs, there is little data about the precise relationships between comprehensive models of personality and the different components of health and well-being in the general population. The data available is limited to factor analytically derived tests that confound temperament and character (Schmutte and Ryff, 1997) as a result of making the simple but invalid assumption of linearity of effects in the complex adaptive systems underlying the within-person development of personality and well-being (Cervone, 2004, 2005; Cloninger, 2008). Unfortunately, such simplifying linearity assumptions are inappropriate for phenomena in which every antecedent variable can have different outcomes ("multi-finality") and every outcome can have different antecedents ("equifinality"), which is always the case for personality and health (Cicchetti and Rogosch, 1996; Cloninger et al., 1997; Schmutte and Ryff, 1997).

Accordingly, we set out to identify a large sample from the general population of the Sharon region in Israel to measure personality and different aspects of health and well-being in a prospective longitudinal study in which we are assessing subjects thoroughly with well-standardized self-reports, psychiatric interviews, and also conducting physical examinations and laboratory testing. Israel provides a particularly informative population because of its long cultural tradition of learning-based encouragement of personal responsibility and community progress (Pease, 2009). This tradition of encouraging character development has resulted in Israel's "Economic Miracle", an outstanding record of capacity for coping and productivity under stressful conditions (Brooks, 2010; Senor and Singer, 2009). Our study participants were highly diverse adults and included a representative number of active workers in highly successful businesses, farms, and professions.

We studied multidimensional profiles of personality so that our person-centered approach would allow an understanding of what happens to an individual person with specific combinations of personality traits adapting within his or her biopsychosocial context. We focused here on character traits as measured by the Temperament and Character Inventory (TCI) because character has been found to be strongly related to well-being whereas temperament traits is only weakly associated (Cloninger, 2004; Ruini et al., 2003). Our aims were to evaluate the interactions among specific combinations of character traits in relation to both the affective ("happiness") and non-affective ("wellness") aspects of health in a large and diverse general population. We analyzed the influence of character on well-being using both linear and non-linear methods to evaluate the practical importance of recognizing the complexity of developmental processes.

2. Methods

Participants were 1102 consecutive community volunteers from the Sharon area of Israel. Participation was solicited via mailbox advertisement, and via a series of thirteen public lectures given in community centers, protected living projects, and a college campus. The conditions for participation included being 40 years of age or older, and having adequate Hebrew to complete the study questionnaire. Participants were not paid, but they are enrolled in a four-year longitudinal study in which they will be eligible for a free medical checkup at a large medical facility. The participants had a mean age of 57.8 years. 36.8% were men and 63.2% women. Among the participants, 69.1% were married, 17.3% were divorced, 9.2% were widowed and the rest were single. There was a range of education: 2.0% had only primary school education, and 2.1% had Ph.D.s. The rest were evenly distributed among high school education, further vocational education, BA and MA degrees. Altogether the participants in this study reflected the demographic characteristics of age-matched residents of the Sharon (Central Bureau of Statistics, 2007).

2.1. Data analysis

All questionnaires were optically scanned using OMR software (Remark Office version 7.0) and imported into SPSS version 17 for Windows, in which analyses were conducted. All

measures reported here were analyzed in standard form with mean zero and standard deviation of one to facilitate comparison.

2.2. Measures

2.2.1. Temperament and character

The TCI-140 includes 140 items that are answered on a 5 point Likert-like scale from absolutely false to absolutely true. It measures four dimensions of temperament: Harm Avoidance (HA), Novelty Seeking (NS), Reward Dependence (RD), and Persistence, (PS) (Zohar and Cloninger, 2010). There are three dimensions of character: Self-directedness (SD), Cooperativeness (CO), and Self-Transcendence, (ST). There are 20 items for each of the 7 dimensions except for ST, which has 16 allowing for inclusion of 4 validity items to assess inattention or carelessness. The TCI-140 was translated into Hebrew for the current study by a process of translation, independent back translation. The reliabilities (alpha) of the scales analyzed here were 0.88 for SD, 0.79 for CO, and 0.89 for ST. In the current study, three participants got all 4 validity items wrong, and four got 3 validity items wrong. These 7 participants constitute 0.63% of the total sample. Their TCI-140's were removed from subsequent analyses.

2.2.2. Affect, Life satisfaction, and Social support

The Positive and Negative Affect Scale (PANAS, Watson et al., 1988) includes 20 items half of which describe negative affective states and half positive, which are endorsed on a Likert-like scale. It yields two subscales, one of negative affect and one of positive affect. Scale reliability estimates were $\alpha = 0.79$ and $\alpha = 0.83$ respectively.

Life satisfaction, sometimes called subjective well-being, was assessed with a five-item report of well-being answered on a seven-point Likert-like scale (Pavot and Diener, 1993). It was translated for the current study by a process of translation, independent back translation, comparison and revision. Its potential scores ranged from 5 (lowest) to 5 (highest), and these were transformed to standard form with mean 0 and standard deviation 1. Scale reliability was $\alpha = 0.87$.

Social support was assessed with the Multidimensional Perceived Social Support Scale (Zimet et al., 1990). It includes four items to assess perceived support from friends, four items about family support, and four items about support by an intimate partner. The 12 items are rated on a 7-point scale each, giving a potential range of scores from 12 to 84, which were transformed to standard form. It has been used extensively in Hebrew translation. Scale reliability in the current study was $\alpha = 0.93$.

2.2.3. Health behavior and Health status

Participants were asked about the frequency of their weekly physical activity, sexual activity, smoking behavior, and their subjective evaluation of their health over the last 30 days on a 5-category scale. The subjective health assessment analyzed here was the first item of the General Health Questionnaire (Knauper and Turner, 2003), asking "how would you describe your health over the past 30 days?" It was rated very bad (1), bad (2), mediocre (3), good (4), or excellent (5). Scores are tabulated here in standard form.

3. Results

3.1. Character profiles

To form the character profiles, the sample was divided into subjects above and below the median for each of the three character traits, after excluding the 48 participants who were in the middle third of the distribution for all three traits.

Then the participants were grouped according to all the possible combinations of high and low character scores to define the 8 possible character configurations shown in Table 1. The character profiles are listed in the order that were previously observed in the USA to be associated with greater happiness and character integration (Cloninger, 2004).

3.2. The relationship of character profile with positive affect

The mean PANAS positive affect scores were compared among people in the 8 character profiles, as shown in Fig. 1. We evaluated the linear effects of character on positive affect by analysis of variance, which revealed highly significant differences among the groups ($F = 35.03$, $p = 0.000$). The comparison between groups with the Bonferroni range correction showed that the creative (SCT) profile was significantly higher than all others with the exception of organized (SCt) profile. The depressive (sct) profile was significantly lower than all 7 others.

We evaluated the non-linear influence of each of the character dimensions on positive affect by paired comparisons of the effect of extremes of each character dimension when the other two were controlled. As a detailed example, the analysis of the influence of Self-transcendence is shown in Table 2. Higher Self-transcendence was consistently associated with higher positive affect for each of the four possible configurations of Self-directedness and Cooperativeness. Likewise higher Self-directedness was consistently associated with higher positive affect for each of the possible configurations of Cooperativeness and Self-transcendence (paired $t = 3.44$ to 6.51, $p = 0.000$). The association of higher Cooperativeness with positive affect was also highly significant when Self-directedness was low: higher Cooperativeness was associated with higher positive affect than lower Cooperativeness in the contrast of moody vs disorganized profiles (sCT vs scT, $t = 2.8909$, $p = 0.004$) and for dependent vs depressive profiles (sCt vs sct, $t = 2.996$, $p = 0.003$). When Self-directedness was high, the association of higher Cooperativeness with higher positive affect was weakly significant for the contrast of organized vs autocratic profiles (SCt vs Sct,

Table 1
Frequency distribution of TCI character profiles.

Character Profile	N	Valid %
SCT—creative	168	16.0
SCt—organized	176	16.8
ScT—fanatical	116	11.1
Sct—autocratic	71	6.8
sCT—moody	57	5.4
sCt—dependent	112	10.7
scT—disorganized	183	17.5
Sct—depressive	164	15.7
Total	1047	100

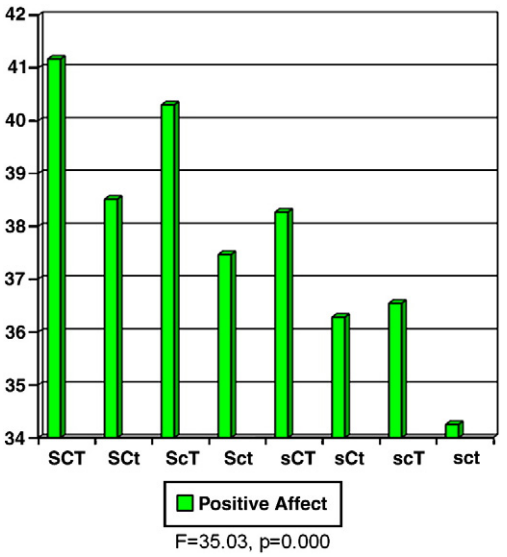

Fig. 1. Positive affect as a function of character profile.

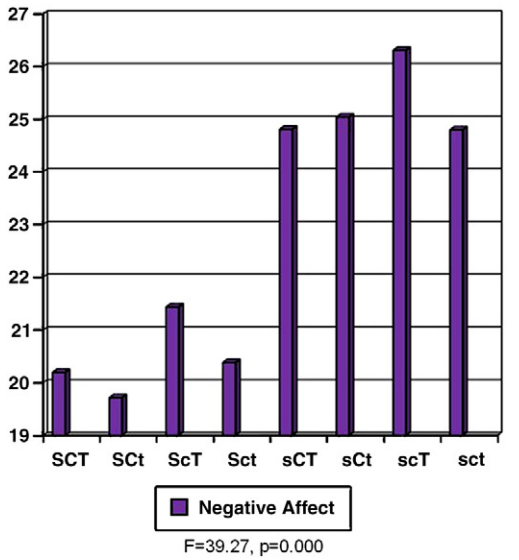

Fig. 2. Negative affect as a function of character profile.

t = 2.03, p = 0.043) and a trend for the contrast of creative vs fanatical profiles (SCT vs ScT, t = 1.61, p = 0.109). Hence the association of positive affect with character profiles was highly non-linear.

3.3. The relationship of character profile with negative affect

The mean PANAS scores for negative affect were also compared among the people with the 8 TCI character profiles, as shown in Fig. 2. Analysis of variance showed that the groups were significantly different from one another (F = 39.27, p = 0.000). The comparison between groups with the Bonferroni range correction showed that the first four character profiles with high Self-directedness (that is, SCT, SCt, ScT, and Sct) were significantly lower than the last four character profiles with low Self-directedness (that is, sCT, sCt, scT, and sct). Thus the single strongest linear discriminator for negative affect is Self-directedness: all those above the median for Self-directedness, whatever their other character scores, were significantly less prone to negative affect.

The non-linear interactions of character dimensions on negative affect were different than those observed for positive affect. Self-directedness had a highly significant inverse association with negative affect for each of the four possible configurations of the other two character traits (t = −5.47 to −8.07, p = 0.000). Cooperativeness had a weak association when Self-transcendence was high: higher Cooperativeness was associated with lower negative affect in the contrast between moody and disorganized profiles (sCT vs scT, t = −2.14, p = 0.033) and there was a trend in the contrast between creative and fanatical profiles (SCT vs ScT, t = −1.77, p = 0.078). Cooperativeness has no significant association with negative affect in other profiles. Self-transcendence was not associated with lower negative affect in any contrast, and was weakly associated with higher negative affect in the contrast of disorganized vs depressive profiles (scT vs sct, t = 2.35, p = 0.020).

Table 2
The association of high Self-transcendence with positive affect.

High ST profile	Low ST profile	Difference in positive affect	Paired-t (probability)
Creative—SCT	Organized—SCt	41 vs 38	6.07 (p = 0.000)
Fanatical—ScT	Autocratic—Sct	40 vs 37	4.65 (p = 0.000)
Moody—sCT	Dependent—sCt	38 vs 36	3.06 (p = 0.003)
Disorganized—scT	Depressive—sct	36 vs 34	4.10 (p = 0.000)

3.4. Correlations among indicators of health and happiness

The relationships among our five indicators of health and happiness were examined. As shown in Table 3, these included positive and negative affects (PANAS), life satisfaction (SWLS), perceived social support (PSS), and perceived or subjective health (SH). Table 3 summarizes the correlations among these measures. Positive and Negative Affectivity were largely uncorrelated (r = −0.09). Scores for the three non-affective measures of life satisfaction, perceived social support, and perceived health were weakly but positively correlated with one another (r = +0.23 to +0.31), so we formed a Composite Health Index (CHI) as the mean of these three non-affective measures in standard form. Each individual measure of health was strongly correlated with the CHI (r = +0.7 to +0.8).

Analysis of variance was used to compare the 8 character profile groups for the additional three measures of well-being besides affect. The profile groups differed significantly for all three measures of well-being, including life satisfaction (F = 41.08, p = 0.000), perceived social support (F = 14.61, p = 0.000), and subjective health (F = 24.81, p = 0.000). The means of the profile groups are depicted in Fig. 3 for all three indicators of health and happiness. Post-hoc group comparisons using the Bonferroni correction showed that the means of the creative (SCT) and of the organized (SCt) profile were significantly higher than those of all profiles that were not

Table 3
Correlations × 100 among measures of aspects of well-being: positive emotionality, negative emotionality, life satisfaction, perceived social support, perceived health, and a Composite Health Index.

	Composite health	Perceived health	Social support	Life satisfaction	Neg affect	Pos affect
Pos affect	43	22	37	37	−9	(100)
Neg affect	−42	−30	−23	−41	(100)−	
Life satisfaction	81	31	23	(100)		
Social support	77	23	(100)			
Perceived health	68	(100)				
Composite health	(100)					

All correlations are significant at p = 0.000 except positive and negative affects (r = −0.09, p = 0.005).

high in both Self-directedness and Cooperativeness (that is, profiles 3–8).

Profile-based configural analysis of the impact of each character trait on the non-affective components of well-being revealed more information than the analysis of variance. Taking interactions among the character traits into account, higher Self-directedness was associated with greater life satisfaction, perceived social support, and perceived health in all contrasts (Table 4). Higher Cooperativeness was strongly associated with greater social support in all contrasts, but had little or no association with life satisfaction or perceived health (Table 4). Self-transcendence had little or no association with any measure of non-affective health (Table 4).

4. Overall relationship of health to character profile

The CHI appeared to provide a good summary measure of perceived non-affective health or wellness whereas the PANAS provided a good summary measure of perceived mood or happiness. Descriptive statistics for CHI and PANAS by character profile are summarized in Table 5. Analysis of variance showed that the groups differed on the CHI significantly (F = 48.19, p = 0.000). The means of the different groups for the CHI are shown in Fig. 4 for ease of inspection. Post-hoc group comparisons using the Bonferroni range correction showed that profiles with high Self-directedness (profiles 1–4) are significantly different from those with low Self-directedness (profiles 5–8).

Compared to the analysis of variance, profile-based configural analysis revealed much more information about the impact of character on health. Taking into account interactions with other traits, the impact of each character trait on non-affective and affective aspects of health is summarized in Table 6. Non-affective health (i.e., "wellness") is measured by the CHI, and affective health (i.e., "happiness") is measured by the presence of positive emotion and the absence of negative emotion. For both wellness and happiness, higher Self-directedness was strongly associated with better health regardless of the other two traits. For wellness, higher Cooperativeness was significantly associated with wellness (i.e., higher CHI) in the contrast of organized vs autocratic character configurations (SCt vs Sct, P = 0.000) and moody vs disorganized character configurations (sCT vs scT, p = 0.005), and had trends in the same direction for the other two configurations (Table 6). Cooperativeness increased wellness largely by enhancing perceived social support (Table 5). Self-transcendence increased happiness by increasing positive emotions, but did not significantly increase wellness or reduce negative emotions (Table 6).

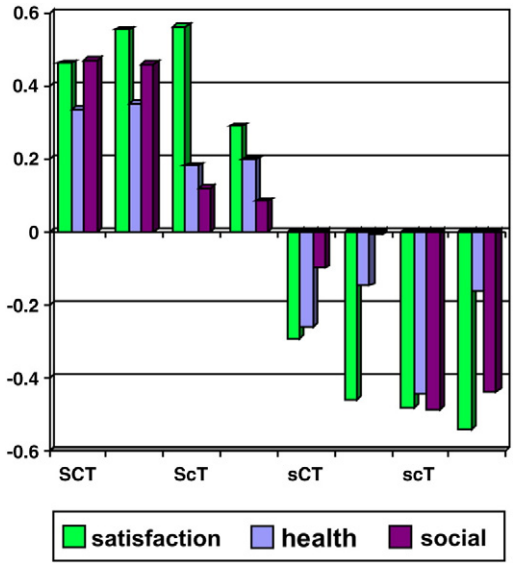

Fig. 3. Life satisfaction, subjective health, and social support as a function of character profile.

Table 4
T-test for each character trait for well-being, social support, and subjective health.

	Life satisfaction		Social support		Subjective health	
	t	p	t	p	t	p
Self-directedness						
SCT vs sCT	7.228	0.000	5.208	0.000	5.485	0.000
SCt vs sCt	8.407	0.000	3.783	0.000	4.135	0.000
ScT vs ScT	7.170	0.000	4.237	0.000	4.196	0.000
Sct vs sct	7.393	0.000	4.232	0.000	2.643	0.009
Cooperation						
SCT vs ScT	−0.874	0.383	2.758	0.006	1.196	0.233
SCt vs Sct	2.633	0.009	3. 396	0.001	1.383	0.168
sCT vs scT	1.56	0.120	3.285	0.001	1.537	0.125
sCt vs sct	0.593	0.554	3.077	0.002	0.082	0.934
Self-transcendence						
SCT vs SCt	−1.056	0.288	0.113	0.910	−0.204	0.838
ScT vs Sct	2.129	0.035	0.244	0.800	−0.102	0.919
sCT vs sCt	1.151	0.251	−0.635	0.526	−0.746	0.456
scT vs sct	0.558	0.577	−0.453	0.651	−2.432	0.016

SCT = creative; SCt = organized; ScT = fanatical; Sct= a utocratic; sCT = moody; sCt = dependent; scT = disorganized; sct = depressive.

Table 5
Descriptive statistics for CHI positive and negative affects by character profile.

Character profile	CHI		Positive affect		Negative affect	
	Mean	SE	Mean	SE	Mean	SE
SCT	.424	.051	41.167	.345	20.196	.398
SCt	.461	.050	38.511	.337	19.716	.389
ScT	.288	.088	40.298	.592	21.439	.683
Sct	.184	.063	37.464	.422	20.384	.487
sCT	−.223	.062	38.267	.415	24.810	.479
sCt	−.201	.079	36.282	.531	25.042	.612
scT	−.471	.049	36.546	.330	26.311	.381
sct	−.382	.052	34.250	.349	24.799	.403

SCT = creative; SCt = organized; ScT = fanatical; Sct = autocratic; sCT = moody; sCt = dependent; scT = disorganized; sct = depressive.

5. The influence of character profiles on extremes of wellness and illness

Adaptive functions are often best revealed at the extremes of a complex dynamic system, so we examined the associations of character profiles with the extremes of wellness and illness. The top sixth and the bottom sixth of the distribution of the CHI were selected and dubbed "best health" and "worst ill-health" respectively. Then the people in each character profile group were compared for the proportion that had "best health" and also "worst health". The profile groups differed significantly in the proportion that had extremely good health (Chi Squared 142.22, df = 7, p = 0.0000) and extremely poor health (Chi Squared 127.08, df = 7, p = 0.0000).

The percentages with best health and worst health are depicted in Fig. 5. The results illustrate the strong impact of Self-directedness on overall health with lesser influences from the other two character traits. Individuals who with creative (SCT) or organized (SCt) profiles are frequently in the best of health, whereas those who are depressive (sct) or disorganized (scT) are frequently in the worst of ill-health. Among the other configurations, there was a shift from predominant good health in fanatical (ScT) and autocratic (Sct) profiles to predominant ill-health in moody (sCT) and dependent (sCt) profiles.

Table 6
T-test for each character trait for chi, negative and positive affect.

	CHI		Negative affect		Positive affect	
	t	p	t	p	t	p
Self-directedness						
SCT vs sCT	8.554	0.000	−7.776	0.000	6.505	0.000
SCt vs sCt	7.542	0.000	−8.071	0.000	3.441	0.000
ScT vs scT	7.091	0.000	−5.466	0.000	4.769	0.000
Sct vs sct	6.574	0.000	−7.03	0.000	5.955	0.000
Cooperation						
SCT vs ScT	0.105	0.105	−1.771	0.078	1.608	0.109
SCt vs Sct	3.643	0.000	−1. 36	0.175	2.03	0.043
sCT vs scT	2.822	0.005	−2.141	0.033	2.889	0.004
sCt vs sct	1.796	0.074	0.295	0.768	2.996	0.003
Self-transcendence						
SCT vs SCt	−0.566	0.572	1.031	0.303	6.069	0.000
ScT vs Sct	1.086	0.279	1.53	0.128	4.645	0.000
sCT vs sCt	−0.219	0.827	−0.274	0.784	3.064	0.003
scT vs sct	−1.105	0.270	2.345	0.020	4.098	0.000

SCT = creative; SCt = organized; ScT = fanatical; Sct = autocratic; sCT = moody; sCt = dependent; scT = disorganized; sct = depressive.

In order to quantify the overall linear influence of the three character variables on happiness and wellness, regression analyses were carried out with the HI or CHI as the dependent variable predicted by the three character traits. TCI character explained 45% of the variance in wellness (CHI, R square 0.449, adjusted R square 0.448, F = 169.4, p = 0.000) and 36% in wellness (CHI, R square 0.363, adjusted R squared 0.362, F = 208.65, p = 0.000). For HI, the linear effect of Self-directedness was strongly dominant (beta = 0.935, t = 5.51, p = 0.000). For CHI, the linear influence of Self-directedness was strong (beta = 0.57, t = 20.6, p = 0.000), Cooperativeness was weak but significant (beta 0.07, t = 2.4, p = 0.016), and Self-transcendence was negligible (beta 0.002, t = 0.96, p = 0.923). The results were virtually the same for each gender separately.

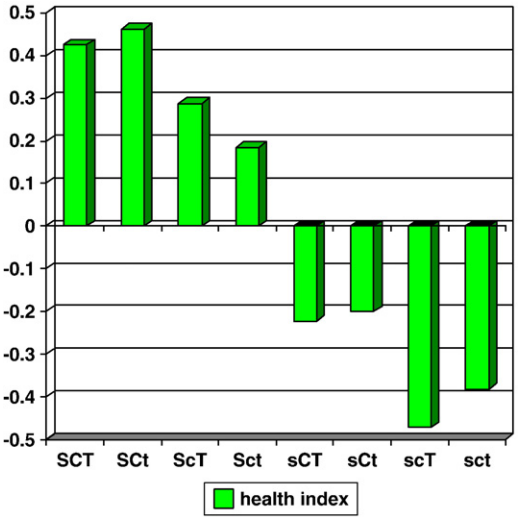

Fig. 4. Mean values of Composite Health Index of the 8 character profile groups.

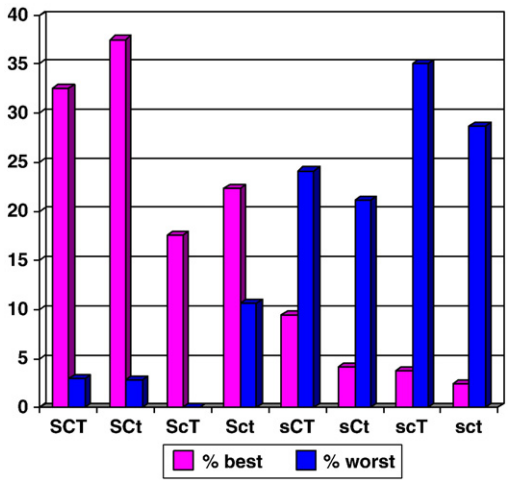

Fig. 5. Percentage of people in each character profile who have "best health" or "worst ill-health".

6. Discussion

Character profiles have a strong association with individual differences in health, including both its non-affective aspect (i.e., "wellness") and its affective aspect (i.e., happiness). In order to quantify the different components of health and well-being, we measured wellness as a composite of perceived health, perceived social support, and life satisfaction. Likewise we measured "happiness" as the difference between standard scores of positive emotion minus negative emotion within each individual. We found that character has a strong impact on the perception of all aspects of health, including social, emotional, and physical well-being.

All three dimensions of character measured by the TCI contribute to individual differences in health. TCI Self-directedness clearly has the strongest impact as a foundation for the regulation of a person's hopes and desires, which influences all aspects of both wellness and happiness, consistent with theories of self-efficacy and self-determination (Cervone, 2004; Ryan and Deci, 2000). Cooperativeness has a strong impact on perceptions of social support, which also makes a substantial impact to increase wellness and reduce negative emotions, consistent with attachment and social engagement theories (Bowlby, 1983; Ryan and Deci, 2001). Self-transcendence has a strong impact on awareness of participation in what is beyond the individual self, which increases the experience of positive emotions, but has little or no impact on wellness or negative emotions, consistent with humanistic and existential theories (Cloninger et al.; Cloninger, 2004; Jaspers, 1968; Rogers, 1995).

Overall, each aspect of character makes a distinct contribution to well-being that depends strongly on its interactions with the other dimensions of character. The influences of character on health are highly non-linear, depending on specific configurations whose influences differ for distinct aspects of health. These distinct patterns of interactions can be understood in terms of the psychology that defines the role of each dimension of character in mental self-government and the regulation of a person's desires, goals, emotions, thoughts, and values.

Self-directedness is measured by a person's being responsible, purposeful, and resourceful (Cloninger et al., 1993). High Self-directedness is associated with hopeful self-confidence, which has a crucial role in recovery from a broad range of physical and mental disorders (Amering and Schmolke, 2009; WHO, 2001). Low Self-directedness is a strong indicator of people with personality disorders, who are typically irresponsible, aimless, and helpless (Svrakic et al., 1993). Health has been defined as a state of physical, mental, and social well-being (WHO, 1946, 2001). The great importance of Self-directedness is shown by its strong association with all indicators of health, including those that are predominantly mental (like affect and life satisfaction), social, or physical (like perceived health). Self-directedness alone explained nearly one-third (i.e., square of 0.57 = 32%) of the variance in wellness and nearly half (i.e., 45%) of the variance in happiness.

Cooperativeness also makes a significant but weak contribution to wellness, explaining only 4% of the variance in wellness, as measured by CHI, in linear regression analyses. Cooperativeness is measured by a person's social tolerance, empathy, and helpfulness. The impact of Cooperativeness is strong on the perception of social support, which in turn has an indirect influence on both wellness and happiness.

Self-transcendence appears to have a negligible impact on health in linear regression analyses. Nevertheless, when the interactions among character traits are taken into account, Self-transcendence has a strong and consistent impact on the presence of positive emotions. In other words, people with higher Self-transcendence are consistently happier than those with lower Self-transcendence when the configuration of the other two character traits is taken into account. Self-transcendence is measured by the capacity of a person to become absorbed in what they enjoy doing and thereby to identify with what is beyond their own transient existence. As a result, people who are higher in Self-transcendence are more likely to experience life with joyful exaltation (Cloninger, 2004, 2007). Self-transcendence has been found to be particularly important for people to adapt well when facing suffering or death (Coward and Reed, 1996). In fact, we observed more positive emotions when people who are higher in Self-transcendence (T) are compared to those who are lower in Self-transcendence (t). The shift toward positive emotions is observed (see Table 2 and Fig. 2) by comparing people with creative vs organized profiles (SCT vs SCt, with average positive affect scores of 41.2 vs 38.5), fanatical vs autocratic profiles (ScT vs Sct, with positive affect scores of 40.3 vs 37.5), moody vs dependent profiles (sCT vs sCt, with positive affect scores of 38. 3 vs 36.3), and disorganized vs depressive profiles (scT vs. sct, with positive affect scores of 36.5 vs 34.3). The level of happiness is greater in each paired comparison between higher vs lower Self-transcendence and controlling for the other two traits. This consistent non-linear impact of Self-transcendence on emotional well-being was missed entirely by linear regression analysis.

The main limitation of these observations is that they are based on a cross-sectional sample in which association, but not causation, can be demonstrated. However, the TCI personality dimensions have been shown to be antecedent causes of individual differences in psychopathology and personality disorders in twin and family studies of vulnerability to neuropsychiatric disorders (Calvo et al., 2009; Ettelt et al., 2008; Farmer et al., 2003; Gillespie et al., 2003; Smith et al., 2008; Zohar et al., 2005). They have also been shown to have predictive validity in prospective studies in the general population (Grucza and Goldberg, 2007) and with specific disorders that have extensive effects on all aspects of health, such as obesity and other eating disorders (Anderson et al., 2002; Fassino et al., 2004; Leombruni et al., 2007). In addition, the present findings are baseline observations in a prospective longitudinal study, so we will be able to test these initial observations by prediction of outcome. The second limitation is that all our measures in these analyses were self-reported and therefore subject to perceptual bias and cognitive distortion. Fortunately, we are also conducting psychiatric and medical interviews as well as physical examinations with laboratory data in our prospective study, so we will be able to compare perceived health with objective health findings.

Our findings lend empirical support to the WHO definition of health as a state of physical, mental, and social well-being, and more than the absence of disease or infirmity (WHO, 1946). Our findings also support the description of mental health as a state of well-being in which people can realize and use their own abilities, can cope with the stresses of life, work and love, and can contribute to their communities (WHO, 2001). We found

that perceptions of health, social support, and life satisfaction were positively correlated with one another and with positive emotions (Table 2). In contrast, each of these measures of health and happiness was inversely correlated with negative emotions. The correlations among these measures were only weak to moderate in strength, so different aspects of health have unique associations with different components of health.

The interdependence of the components of health makes it clear that much understanding can be lost when people are reduced to separate organ systems or when physical, mental, and social well-being are viewed in isolation (Cloninger, 2004). For example, TCI personality traits predict as much or more variability in risk for atherosclerosis than traditional measures like smoking or cholesterol levels (Hintsanen et al., 2009). Physical, mental, and spiritual well-being simply cannot be separated without loss of understanding of human nature, presumably because each of these components of well-being has evolved as an adaptive response to the challenges of life in the long history of human evolution (Cloninger, 2009). Multiple systems of learning and memory are integrated in human beings—behavioral conditioning, semantic learning, and self-aware consciousness, so each must be considered as an interdependent aspect of the whole person's adaptive functioning and well-being (Cloninger, 2009).

Configural analysis of personality profiles provides a useful way to describe the multidimensional nature of human adaptive functioning. Configurations of temperament and of character provide a profile of different dimensions of the whole person, rather than considering variables that distinguish groups without any account of their interactions within the individual. Such person-centered analyses are crucial for understanding development because configurations in a non-linear dynamic system are "meta-stable" that is, they tend to be relatively stable, even though they are self-organizing and may transform abruptly in response to even small changes in conditions (Cloninger et al., 1997). Furthermore, biological and psychosocial processes function as non-linear dynamical systems in general and only approximate the assumptions of linearity when there are negligible changes in background conditions (Waldrop, 1992). That is, linearity is typically a local approximation, not a generally valid characteristic of biopsychosocial systems (Cloninger, 2004; Wright, 1984). Consequently, linear statistical analyses never justify any conclusions about individual people because even small changes in other unmeasured or uncontrolled variables can have a strong impact on results, as we demonstrated here by doing analyses with and without assuming linearity. We clearly found that well-being depends on specific interactions that are strong and predictable from an understanding of the non-linear dynamics of personality development.

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Conflict of interest

The authors declare no conflict of interests.

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