

On the incremental validity of irrational beliefs to predict subjective well-being while controlling for personality factors

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This research examines the incremental validity of irrational thinking as conceptualized by Albert Ellis to predict diverse aspects of subjective well-being while controlling for the influence of personality factors. Rational-emotive behavior therapy (REBT) argues that irrational beliefs result in maladaptive emotions leading to reduced well-being. Although there is some early scientific evidence for this relation, it has never been investigated whether this connection would still persist when statistically controlling for the Big Five personality factors, which were consistently found to be important determinants of well-being. Regression analyses revealed significant incremental validity of irrationality over personality factors when predicting life satisfaction, but not when predicting subjective happiness. Results are discussed with respect to conceptual differences between these two aspects of subjective well-being.

Sobre la creciente validez de las creencias irracionales a la hora de predecir el bienestar subjetivo a la vez que se controlan los factores de personalidad. Este estudio examina la creciente validez del pensamiento irracional tal y como lo describió Albert Ellis a la hora de predecir los distintos aspectos del bienestar subjetivo a la vez que se controla la influencia de los factores de personalidad. La terapia racional-emotiva conductual (TREC) se basa en que las creencias irracionales tienen como resultado emociones de inadaptabilidad que llevan a un menor bienestar. A pesar de que hay algunas primeras pruebas científicas indicando esta relación, nunca se ha investigado si esta conexión persistiría si a la vez se controlan estadísticamente los «Big Five personality factors», que se descubrió que eran determinantes para el bienestar. Los análisis de regresión han revelado un incremento significativo en la validez de la irracionalidad por encima de los factores a la hora de predecir la satisfacción en la vida, pero no a la hora de predecir la felicidad subjetiva. Los desacuerdos respecto a estos resultados se basan en las diferencias conceptuales entre estos dos aspectos del bienestar subjetivo.

Rational-emotive behavior therapy (REBT; Ellis, 1962, 1970, 2003) proposes a distinction between rational and irrational beliefs. Irrational beliefs are defined as unrealistic and absolutist ideas. At the core, irrational beliefs are demanding thoughts which are connected with self-evaluations («I absolutely always have to be thoroughly competent, adequate, and lovable with respect to anything and anybody, or else I am a worthless person») and low frustration tolerance («I cannot stand frustration»). Rational beliefs, in contrast, reflect realistic and flexible thoughts, including preferences such as «I would (very much) like to be successful, but if I'm not, I still am a worthwhile person».

Rational and irrational beliefs are proposed to differentially contribute to humans' psychological adjustment: «[People] usually, though not always, create and construct healthy feelings by believing rational [...] beliefs, and they usually [...] create self-defeating feelings and behaviors by constructing and creating irrational [...] beliefs» (Ellis, 2003, p. 219f.). Thus, rational beliefs

are proposed to promote adaptive emotions, while irrational beliefs are proposed to promote self-downing maladaptive emotions (cf. David, Schnur, & Belloiu, 2002; Spörrle & Försterling, 2007; Spörrle & Försterling, 2008).

In line with this, irrational beliefs have been shown to be related with various indicators of psychological maladjustment (e.g., Deffenbacher, Zwemer, Whisman, Hill, & Sloan, 1986; Gormally, Sipps, Raphael, Edwin, & Varvil-Weld, 1981; Strobel, Bekk, & Spörrle, 2008). Moreover, irrationality is inversely related to psychological adjustment as reflected by general subjective well-being (e.g., Ciarrochi & West, 2004; Day & Maltby, 2003; Froh, Fives, Fuller, Jacofsky, Terjesen, & Yurkewicz, 2007; Howlett, 1994; Kinney, 2000; Spörrle & Welp, 2006; Spörrle, Welp, & Försterling, 2006).

Extending these correlational data, interventions directed at altering irrational beliefs effectively improve psychological adjustment (Engles, Garnefsky, & Diekstra, 1993; González, Nelson, Gutkin, Saunders, Galloway, & Shwery, 2004; Hajzler & Bernard, 1991; Lyons & Woods, 1991; Silverman, McCarthy, & McGovern, 1992). To sum up, irrational beliefs were consistently found to be associated with psychological maladjustment.

On the other hand, some of the Big Five personality factors were also found to be associated with psychological maladjustment. In their meta-analysis Malouff, Thorsteinsson, and Schutte (2005)

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found that different clinical symptoms were associated in a similar way with a pattern of high neuroticism, low extraversion, low agreeableness, and low conscientiousness. Moreover, subjective well-being as an indicator of psychological adjustment has been found to be associated with the Big Five personality factors. A meta-analysis conducted by De Neve and Cooper (1998) found correlations between subjective well-being and especially neuroticism but also the other four factors (see also Diener, Oishi, & Lucas, 2003).

Numerous studies report relations between irrationality and personality factors (e.g., Cuhane & Watson, 2003; Day & Maltby, 2003; Hart & Hope, 2004; Hutchinson, Patock Peckham, Cheong, & Nagoshi, 1998; Kordacova, 1989; Korlinski, 1982; Wicker, Richardson, & Lambert, 1985; Zurawski & Smith, 1987). Interestingly, however, out of Costa and McCrae's Big Five personality factors, the very most of these studies have only included neuroticism, which was consistently associated with irrationality, whereas irrationality's relation with the other personality factors has not been reported.

Studies assessing irrationality together with the full Big Five personality factor model of Costa and McCrae are sparse, and even if irrationality together with Big Five measures had been used correlations were not reported (e.g., Calvete & Cardenoso, 2001; Zimmermann, Rossier, Meyer Stadelhofen, & Gaillard, 2005).

To our knowledge, only two studies report relations between the full personality model and irrationality: Blau, Fuller, and Vaccaro (2006) found irrationality-related coping responses (but not irrationality itself) to correlate with some of the Big Five personality factors in their sample ($N=194$). Out of the five personality factors, only neuroticism did significantly correlate with all indicators of irrationality, whereas the pattern was not as clear regarding the other personality factors.

Generally, these results should be interpreted with some caution. First, the measure used by Blau et al. (2006) does not assess actual irrational beliefs but associated (e.g., affective) aspects (sample item: «I often feel depressed about how unfair and cruel people are and about how badly my life is going»). Thus, this study does not directly test the relation between irrational beliefs and personality factors. Second, the authors' sample is quite heterogeneous, with about a third of the participants being clinical outpatients, and the rest being university students. Since data of these two groups were aggregated the relations found might be due to the merging of extreme groups. An important issue, however, is that the authors reported incremental validity of irrationality beyond personality factors when predicting borderline personality disorder in regression analysis thus providing first empirical evidence for a potential incremental value of irrationality beyond personality.

Davies (2006) used a gender-skewed student sample ($N=102$, 80% females) and found correlations of two different global measures of irrationality with neuroticism ($r=.37/.38$), but also with conscientiousness ($r=.20/.26$), and openness ($r=-.22/-.28$). No analyses investigating the incremental validity of irrationality were performed.

Summarizing, most studies considering the relation between personality factors and irrationality investigated only neuroticism and found positive correlations. The two studies including all of the Big Five personality factors do not allow for generalization and do not give any clear indications on which personality factors (besides neuroticism) should be expected to be associated with irrationality. In order to extend this very sparse empirical evidence and to

overcome its methodological limitations we further investigated the association between personality factors and irrationality.

Moreover, in terms of predictive validity and theoretical conceptualization there is another reason to do so: Clark, Watson, and Mineka (1994) proposed negative emotionality (neuroticism) to reflect a core «temperamental sensitivity to negative stimuli» (p. 104) associated with (among others) non-mood variables, such as negative cognitions and negativistic appraisals of self. Accordingly, irrationality has been argued to essentially represent the same underlying construct as neuroticism (Zurawski & Smith, 1987). If irrationality is actually nothing else but neuroticism (or other personality factors) it should not additionally contribute in explaining variance of psychological adjustment variables over and above personality. However, following the theoretical assumptions of REBT, we argue that irrationality should incrementally predict psychological adjustment.

Indeed, a first indication of incremental validity of irrationality in predicting psychological maladjustment is given by the study of Blau, Fuller, and Vaccaro (2006) whereas until now there is no study investigating the incremental validity of irrationality when predicting psychological adjustment.

The aim of our study therefore is twofold: First, we want to extend the scientific basis of just two empirical studies in order to further explore the relation between irrationality and the Big Five personality factors by using a larger and more representative sample, and measures of irrationality and personality factors with superior validity. Second, until now there is no study simultaneously using personality factors and irrationality in predicting psychological adjustment (rather than *maladjustment*) variables. Considering that irrationality has even been argued to be nothing more than one of the personality factors (Zurawski & Smith, 1987) is theoretically relevant to examine the potential distinctiveness of irrationality by investigating whether irrationality significantly contributes to variance explained in subjective well-being when the influence of personality factors is being controlled for.

Method

Participants

In the 200 respondents sample, sex was equally distributed (99 male, 99 female, 2 missing). Average respondent age was 28.1 years ($SD=11.5$). The sample was recruited on the university campus and primarily consisted of students (62.5%). Among the non-student respondents, 43.1% held at least one university degree, and most were employees (55.6%).

Procedure

Participants completed a questionnaire (duration: 15-20 minutes) containing an irrationality scale, a Big Five personality measure, a life satisfaction scale, and a subjective happiness scale.

Instruments

Irrationality was assessed with the Six Irrational Beliefs Scale (6IRBS; Försterling & Bühner, 2003), a very brief six item measure which captures several aspects of irrational thinking with high content validity since the items (unlike most irrationality scales) only contain irrational thoughts but no emotional or behavioural

consequences of these. For assessing personality factors, we used the German translation of Costa and McCrae's NEO-Five-Factor-Inventory (NEO-FFI) by Borkenau and Ostendorf (1993). Two facets of overall subjective well-being were assessed: A predominantly cognition-based rating of life satisfaction was obtained by the Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985), and a more affective global rating of subjective happiness was obtained by the Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999).

Data analysis

After examining correlations between irrationality, the Big Five personality factors, life satisfaction, and subjective happiness, we conducted a series of regression analyses. In order to assess the variance proportion of irrationality which can be accounted for by the Big Five personality factors, irrationality was regressed on the Big Five personality factors while controlling for sex and age in a blockwise entry regression. In order to examine whether irrationality incrementally predicts life satisfaction over and above the Big Five personality factors, a blockwise entry regression was conducted with life satisfaction as dependent variable. In step one, age and sex were introduced as control variables. In step two, the Big Five personality factors were introduced as predictors. In step three, irrationality was added. A significant incremental predictive validity of irrationality is evident if there is a significant increase of R^2 after introducing irrationality as a predictor in the third step of the regression analysis. In order to examine whether irrationality incrementally predicts subjective happiness over and above the Big Five personality factors, an analogous three-step blockwise entry regression analysis was conducted with subjective happiness as dependent variable.

Results

Missing value analysis

The data set contained a low rate of missing values (0.32%) which Little's MCAR-Test revealed to be completely at random ($\chi^2[1187, N= 200]= 1205.66, ns$). Missing values were imputed using both expectation maximization and regression estimates resulting in identical values in 63% of the cases. In case of divergent estimates the mean of the two estimates was used for imputation.

Reliabilities

Reliabilities (Cronbach's α) were satisfactory to good for all Big Five factors ($.71 < \alpha < .86$), life satisfaction ($\alpha = .80$), and subjective happiness ($\alpha = .72$), whereas the internal consistency of the irrationality scale was problematically low ($\alpha = .49$). Obviously, the width of irrationality aspects measured by the 6IRBS, together with its brevity, is at cost of internal consistency.

Nevertheless, we consider this instrument a valid measure of irrationality since each single item closely resembles one of the central irrational beliefs formulated by Albert Ellis himself (e.g., Ellis, 1962, 1970) without including affective or behavioural correlates of irrationality as in most other irrationality measures (cf. Spörrle, Welppe, Ringenber, & Försterling, 2008). Additionally, low reliability is not a major impediment to the use of a scale when it has «other desirable properties, such as meaningful content coverage

of some domain» (Schmitt, 1996, p. 352) which can be assumed for this scale (cf. Försterling & Bühner, 2003). Most importantly, low reliability can only attenuate, not inflate, correlations (see Cohen, Cohen, West, & Aiken, 2003, p. 57), indicating that our analyses will tend to provide a conservative estimate of associations with and predictive values of irrationality.

Correlations

Correlation analyses were conducted including all personality factors, irrationality, life satisfaction, and subjective happiness (see Table 1). Neuroticism, extraversion, openness, and conscientiousness were significantly related to both subjective happiness and life satisfaction, while agreeableness was significantly related to subjective happiness only. The sizes of the correlations were medium to high for neuroticism ($r_{N,SWLS} = -.42, r_{N,SHS} = -.48, ps < .01$), extraversion ($r_{E,SWLS} = .31; r_{E,SHS} = .43, ps < .01$), and conscientiousness ($r_{C,SWLS} = .31, r_{C,SHS} = .23, ps < .01$). Correlations of openness with subjective happiness and life satisfaction were low to moderate ($r_{O,SWLS} = .18, r_{O,SHS} = .15, ps < .05$), and agreeableness was moderately related to subjective happiness only ($r_{A,SHS} = .23, p < .01$).

Irrationality, on the other hand, showed moderate negative relations with life satisfaction and subjective happiness ($r_{6IRBS,SWLS} = -.32, r_{6IRBS,SHS} = -.28, ps < .01$), a strong positive association with neuroticism ($r_{6IRBS,N} = .50, p < .01$), and small negative relations with openness ($r_{6IRBS,O} = -.16, p < .05$), and agreeableness ($r_{6IRBS,A} = -.16, p < .05$).

Regression analysis for predicting irrationality

In order to measure the amount of variance in irrationality which can be accounted for by sex and age (cf. Fontecilla Pellón & Calvete Zumalde, 2003), and all of the personality factors, these variables were used as predictors of irrationality in a regression equation. After controlling for sex and age ($R^2 = .01, R^2_{adj} = .00, F[2, 195] = 0.96, ns$), the Big Five personality factors were entered in a second step and explained about a third of variance in irrationality ($R^2 = .37, R^2_{adj} = .34; R^2_{change} = .36, p_{change} < .001$). This indicates that irrationality as measured in this study shared substantial amounts of variance (approximately 36%) with the Big Five personality factors.

Regression analysis for predicting subjective well-being

Two regression analyses predicting life satisfaction and subjective happiness investigated the incremental validity of irrationality. In step one, only age and sex were entered as predictors. In step two, the five personality factors were added as a second set of predictors. Finally, in step three, irrationality was entered additionally in order to examine its potential incremental validity.

When predicting life satisfaction (see Table 2), step one revealed as no relevant predictors ($R^2 = .01, R^2_{adj} = -.01, ns$). Step two confirmed that personality factors significantly predict life satisfaction ($R^2 = .25, R^2_{adj} = .22; R^2_{change} = .25, p_{change} < .001$). Specifically, neuroticism was a negative predictor of life satisfaction ($\beta = -.31, p < .001$). Furthermore, positive but weaker predictors of life satisfaction were extraversion ($\beta = .14, p < .05$), and conscientiousness ($\beta = .15, p < .10$). Openness ($\beta = .11, ns$) and

Table 1
Means, Standard Deviations, Intercorrelations and Reliabilities of Personality Factors, Irrationality and Indicators of Subjective Well-Being

	M	SD	N	E	O	A	C	IRR	SWLS	SHS
N	2.66	.67	(.86)	-.38***	-.12(*)	-.06	-.36***	.50***	-.42***	-.48***
E	3.44	.51	-.46	(.78)	.21**	.10	.30***	-.02	.31***	.43***
O	3.56	.58	-.15	.27	(.78)	.25***	.07	-.16*	.18*	.15*
A	3.51	.47	-.08	.14	.33	(.71)	.06	-.16*	.08	.23**
C	3.65	.54	-.43	.38	.08	.08	(.81)	.04	.31***	.23**
IRR	2.86	.60	.76	-.04	-.25	-.26	.06	(.49)	-.32***	-.28***
SWLS	5.33	.92	-.51	.39	.23	.11	.39	-.52	(.80)	.47***
SHS	3.63	.67	-.61	.57	.20	.32	.30	-.47	.62	(.72)

Note:
 *** Correlation is significant at the 0.001 level (2-tailed).
 ** Correlation is significant at the 0.01 level (2-tailed).
 * Correlation is significant at the 0.05 level (2-tailed).
 (*) Correlation is marginally significant (< .10) (2-tailed).
 Correlations corrected for attenuation using Spearman's (1904) formula estimating the maximum correlation when error in both variables is corrected for are displayed below the main diagonal
 Reliabilities (Cronbach's alpha based on standardized items) in brackets in the main diagonal
 Abbreviations: M= Mean, SD= Standard Deviation, N= Neuroticism, E= Extraversion, O= Openness, A= Agreeableness, C= Conscientiousness, IRR= Irrationality, LS= Life Satisfaction, SH= Subjective Happiness.

agreeableness ($\beta = .01, ns$) obtained no significance in predicting life satisfaction. In step three, irrationality showed to incrementally predict life satisfaction ($\beta = -.24, p < .01, R^2 = .29, R^2_{adj} = .26; R^2_{change} = .03, p_{change} < .01$).

When predicting subjective happiness (see Table 3) in step one, age and sex revealed as no relevant predictors ($R^2 = .01, R^2_{adj} = .00, ns$). Step two confirmed that personality factors significantly predicted subjective happiness ($R^2 = .33, R^2_{adj} = .30; R^2_{change} = .32$).

Table 2
Blockwise Entry Regression Predicting Life Satisfaction by Using Sex and Age, Personality Factors, and Irrationality

Predictor	ΔR^2	B	SE _B	β
Step 1	.01			
Sex		.00	.00	.01
Age		.00	.01	.03
Step 2	.25***			
Neuroticism		-.44	.10	-.31***
Extraversion		.26	.13	.14*
Openness		.18	.11	.11
Agreeableness		.03	.13	.01
Conscientiousness		.25	.15	.15†
Step 3	.03*			
Irrationality		-.36	.14	-.24**
Total R ²	.29***			

Note: † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.
 Step 1: $R^2 = .01, F(2, 195) = 0.55, ns$; Step 2: $R^2 = .26, F(7, 190) = 9.09, p < .001$; Step 3: $R^2 = .29, F(8, 189) = 9.39, p < .001$.
 Residuals were normally distributed (Kolmogorov-Smirnoff test nonsignificant, $p > .05$).
 Collinearity of predictors was not problematic (tolerance values $> .60$; condition indices up to $> .50$, but none of the components with a high condition index contributing to the variance of two or more variables with a variance proportion above $.50$). In order to correct for heteroscedasticity which was indicated for steps 2 and 3 by White tests ($p > .05$), we computed robust HC3 standard errors according to the recommendations of Davidson and McKinnon (1993) and Long and Ervin (2000)

Table 3
Blockwise Entry Regression Predicting Subjective Happiness by Using Sex and Age, Personality Factors, and Irrationality

Predictor	ΔR^2	B	SE _B	β
Step 1	.01			
Sex		-.10	.09	-.08
Age		.00	.00	.04
Step 2	.32***			
Neuroticism		-.38	.07	-.38***
Extraversion		.33	.09	.25***
Openness		.00	.07	.00
Agreeableness		.21	.09	.15*
Conscientiousness		.01	.08	.01
Step 3	.00			
Irrationality		-.09	.08	-.08
Total R ²	.33***			

Note: * $p < .05$, *** $p < .001$.
 Step 1: $R^2 = .01, F(2, 195) = 0.76, ns$; Step 2: $R^2 = .33, F(7, 190) = 13.08, p < .001$; Step 3: $R^2 = .33, F(8, 189) = 11.62, p < .001$.
 Residuals were normally distributed (Kolmogorov-Smirnoff test nonsignificant, $p < .05$).
 Tolerance values ($> .60$) did not indicate a collinearity problem. However, in addition to condition indices being fairly high (up to $> .50$), both extraversion and conscientiousness loaded strongly (.48/.57) on the same component indicating a collinearity problem of these two facets with respect to subjective happiness. Thus, beta weights of these predictors are likely to be biased and their interpretability is restricted. Homoskedasticity is given as indicated by White tests nonsignificant ($p < .05$) for all three steps.

$p_{change} < .001$). Specifically, neuroticism was a strong predictor of subjective happiness ($\beta = -.38, p < .001$). Furthermore, positive predictors of life satisfaction were extraversion ($\beta = .25, p < .001$), and agreeableness ($\beta = .15, p < .05$). Openness ($\beta = .00, ns$), and conscientiousness ($\beta = .01, ns$) were no significant predictors of subjective happiness. In step three, irrationality showed to not incrementally predict subjective happiness ($\beta = -.08, ns; R^2 = .33, R^2_{adj} = .30; R^2_{change} = .00, ns$).

Discussion

The association between irrationality and neuroticism repeatedly shown in the literature could be replicated in our sample. Furthermore, as Davies (2006) has shown, there was an association between irrationality and openness. Additionally, irrationality showed significant association with agreeableness. Thus extending the current status of research, our findings indicate that irrationality as defined by REBT is strongly associated with neuroticism and to a smaller but still significant extent with openness and agreeableness.

Despite the fact that these personality factors were systematically associated with irrationality, they altogether explained only about a third of variance in irrationality which supports the distinctiveness of irrationality from personality factors. Beyond that, irrational thinking did reveal incremental validity when predicting life satisfaction in regression analysis while controlling for personality factors which partly had significant predictive value as well. Consequently, irrationality contained distinct features relevant for adjustment which are neither entirely captured by neuroticism (as argued by Zurawski & Smith, 1987) nor by one of the remaining personality factors (cf. Breugst, Spörrle, & Welpel, 2008).

However, this result was not obtained when predicting subjective happiness which was only predicted by personality factors but not by irrationality. A plausible explanation for this result can be derived from the fact that the two measures capture different aspects of subjective well-being: The Satisfaction With Life Scale asks for an evaluation of life in general (Diener, Emmons, Larsen, & Griffin, 1985). Due to its cognitive nature, such an evaluative judgment is probably more directly influenced by *cognitive* processes, such as irrationality. Lyubomirsky and

Lepper's (1999) subjective happiness scale, on the other hand, asks for a global rating of happiness which by definition is more closely related to *temperamental* and, therefore, dispositional components of subjective well-being, leaving less variance to be accounted for by cognitive processes like irrationality.

Our study extends the hitherto very sparse empirical basis regarding the associations between personality factors and irrationality and indicates that (1) neuroticism is substantially positively associated with irrationality, that (2) to a smaller but also systematic extent also agreeableness and openness are negatively associated with irrationality, (3) that irrationality cannot be fully explained by all of the Big Five personality factors and (4) that irrationality exhibits incremental value when predicting life satisfaction (but not happiness).

In addition to the theoretical relevance of these findings indicating the association but distinctiveness of irrationality from personality and the predictive value of irrationality for psychological adjustment this study also points to practical applications: Irrationality, which had repeatedly been demonstrated to be modifiable by means of therapeutic interventions, provided incremental value when predicting life satisfaction in addition to personality factors which are substantially less prone to interventions. This finding points to the possibility of using REBT-based trainings as an effective method to increase life satisfaction. In addition to other interventions from the field of positive psychology aiming at increasing life satisfaction (cf. Seligman, Steen, Park, & Peterson, 2005), methods used in REBT to reduce irrationality and, thus, maladjustment might very well be suited to promote individual life satisfaction, as well. For instance, addressing central irrational thoughts such as absolutistic demands (i.e., demandingness) and self-evaluations such as 'I *absolutely have to* attain a certain goal otherwise I am a failure' by means of self-talk, debating, and group discussions (cf. Shannon & Allen, 1998) during training or coaching sessions seems to be an adequate way to increase individual awareness of the destructive power as well as the illogical origin of such beliefs. Therefore, such interventions provide the basis for the successful modification of irrational cognitions which, in turn, will result in fewer satisfaction-decreasing cognitive, affective, and behavioral responses to the unpleasant events our lives have ready for us.

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