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The Influence of Environment and Personality on the Affective and Cognitive Component of Subjective Well-being

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Abstract Subjective well-being (SWB) has two components: affective well-being (AWB) and cognitive well-being (CWB). The present study demonstrated that AWB and CWB have are influenced by different factors in a nationally representative sample in Germany (N = 1053). Neuroticism was a stronger predictor of AWB than CWB. Unemployment and regional differences between the East and West of Germany were stronger predictors of CWB than AWB. In addition, the study demonstrated that shared evaluative biases in personality and SWB ratings inflate estimates of the effect size of personality. After controlling for this bias, the effects of environmental factors (unemployment, regional differences) on CWB were stronger than the effects of personality (neuroticism). The results demonstrate that AWB and CWB are distinct components of SWB and that research findings for one component may not generalize to the other component. The results also raise important questions about the weighing of the two components in the creation of subjective social indicators.

Keywords Well-being · Life satisfaction · Affect · Unemployment · Personality · Neuroticism

1 Introduction

Since the seminal contributions of Andrews and Withey (1976) and Cantril (1965), the scientific study of happiness has become a popular topic in the social sciences (Diener et al. 1999; Frey and Stutzer 2002; Kahneman 1999; Michalos 1985; Veenhoven 1994). In

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a seminal article, Diener (1984) proposed subjective well-being (SWB) as a more precise scientific concept for the broad and ambiguous folk concept of happiness. SWB has two components that reflect dominant philosophical theories of happiness and well-being. The affective component (AWB) is based on hedonic theories of happiness (Sumner 1996). It is defined as the balance of pleasure and displeasure in people's lives. The cognitive component of SWB (CWB) is based on subjective evaluation theories of well-being (Sumner 1996). Accordingly, individuals are in the best position to evaluate their lives. They do so on the basis of a comparison of a subjectively constructed ideal and a comparison of their actual life with this ideal. CWB is typically assessed with one or more life satisfaction items (Andrews and Whitey 1976). Although these judgments are likely to be based on heuristics, a large body of empirical research has shown that life satisfaction judgments are highly correlated with more comprehensive assessments of satisfaction in important life domains (Andrews and Whitey 1976; Schimmack and Oishi 2005), and show convergent validity with informant ratings (Walker and Schimmack in press; Schimmack and Diener 2003; Schimmack et al. 2004).

The distinction between cognitive well-being (CWB) and affective well-being (AWB) has important implications for the scientific study of happiness and public policy decisions. If AWB and CWB are distinct types of happiness or SWB, individuals and policy makers have to weigh the importance of the two components in their decisions. That is, some individuals may aim to maximize AWB, whereas others may aim to maximize CWB.

Despite the theoretical importance of the relation between AWB and CWB, surprisingly few empirical studies have systematically examined this relation (Schimmack 2007). One study used self-ratings and informant ratings to examine this issue (Lucas et al. 1996). AWB and CWB were significantly positively correlated, but not identical constructs. Further evidence for the distinction between AWB and CWB stems from a few studies that show opposite relations of AWB and CWB with predictor variables. For example, CWB tends to show a slight positive correlation with age, whereas AWB tends to decrease with age (Campbell 1976). These findings suggest that AWB and CWB are distinct, yet related constructs. Over 30 years ago, Campbell (1976) suggested "we have come to the point where we must stop using the word happiness indiscriminately to refer to any aspect of experience we regard as positive" (p. 120). He suggested that it was more important to develop valid measures of different types of happiness and to study the empirical relations between them. Surprisingly, only a few articles have systematically examined the distinct predictors of AWB and CWB.

Schimmack et al. (2002a) proposed a model that accounts for the shared and non-shared variance between AWB and CWB. Accordingly, AWB and CWB are correlated because people partially rely on AWB when they judge CWB. In other words, people rely on the amount of pleasure and displeasure in their lives to evaluate their lives. However, in addition individuals rely on information that is independent of AWB. For example, parents may be satisfied with their lives if they have healthy and happy children, even though having healthy and happy children does not increase their own AWB. This model makes two predictions. First, predictors of AWB should also be related to CWB, and the correlation with AWB should be stronger than the correlation with CWB. Second, predictors of CWB should not be correlated with AWB, unless they have an independent direct influence on AWB.

Schimmack et al. (2002a) provided first evidence for this model. They found that the personality traits extraversion and neuroticism had a direct influence on AWB, whereas the influence of these personality traits on CWB was mediated by AWB. The authors proposed that extraversion and neuroticism are biological dispositions that influence individuals' affective experiences, and therewith directly determine AWB. However, the personality

traits influence CWB only to the extent that individuals rely on AWB when they evaluate their lives.

Additional support for this model stems from cross-cultural studies of the relation between AWB and CWB (Suh et al. 1998). AWB and CWB are more highly correlated in individualistic cultures than in collectivistic cultures because individualists rely more on AWB to judge CWB. Schimmack et al. (2002b) demonstrated that culture also moderated the relation between personality and CWB, but not the relation between personality and AWB. The reason is that personality has a direct influence on AWB, but the influence of personality on CWB is indirect and depends on the weight people attach to AWB when they evaluate their lives.

So far, no study has tested the prediction of the model that factors that influence CWB are not correlated with AWB, unless they have an independent direct effect on AWB. Furthermore, so far unique predictors of CWB have not been identified. Thus, it remains possible that the stronger effect of personality traits on AWB than on CWB is a method artifact due to lower validity of CWB measures (Schimmack and Oishi 2005; Schwarz and Strack 1999) or an artifact of content overlap between personality measures and measures of AWB (Schimmack et al. 2004). To alleviate this concern, it would be necessary to demonstrate that some factors are stronger predictors of AWB than CWB, whereas other factors are stronger predictors of CWB than AWB. Another limitation of previous studies was that these studies relied predominantly on student samples. One problem of student samples is that the homogeneous environment reduces the influence of environmental factors on variation in well-being. For example, it is well known that unemployment has a strong negative effect on CWB (e.g., Lucas et al. 2004), but this environmental factor does not contribute to individual differences in students' well-being.

The present study addressed all of these limitations by examining the relation between personality, unemployment, AWB and CWB within one national representative sample. Although previous studies have examined some of these relations, this is the first study that examines the relations among these constructs within a single study. Specifically, the study examined the relations of AWB and CWB with the Big Five personality traits (neuroticism, extraversion, openness to experience, agreeableness, conscientiousness), unemployment, and regional differences (Eastern versus Western parts of Germany) within Germany. The following literature review explains the theoretical significance of these variables and reviews relevant research findings in previous studies.

1.1 Affective Well-being and Cognitive Well-being

Affective well-being and CWB were expected to be positively correlated (Andrews and Whitey 1976; Lucas et al. 1996; Schimmack et al. 2002a, b; Schimmack 2007). Furthermore, the relationship should remain after controlling for shared evaluative biases (Lucas et al. 1996). AWB and CWB should also share unique variance after controlling for personality factors and environmental factors. The reason is that the mediator model assumes a direct influence of AWB on CWB (Schimmack et al. 2002a, b).

1.2 The Structure of Personality

The five-factor model of personality is the most widely used taxonomy of personality characteristics (Larsen and Buss 2008). It distinguishes five personality traits: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. Theoretically,

the five traits are often treated as five independent dimensions. However, empirical measures of the Big Five typically show small to moderate correlations among the Big Five (Digman 1997). Traditionally, these correlations are often ignored in studies that relate Big Five measures to other constructs. Neglecting these correlations, however, can lead to misleading conclusions because observed correlations can be spurious. For example, Vitterso (2001) found that the relation between extraversion and SWB was spurious after controlling for neuroticism. This finding raises an important question about the nature of the shared variance among the Big Five.

One possibility is that shared variance is due to even broader personality traits (Digman 1997). Thus, the contribution of the shared variance among personality traits to the prediction of AWB and CWB would still reveal effects of personality, although these effects would be due to effects of broader personality traits than the Big Five. However, multi-trait-multi-method studies show that correlations among the Big Five by the same rater are much higher than cross-rater correlations among the Big Five (Biesanz and West 2004). A quantitative analysis of multi-trait-multi-method studies revealed that a large percentage of the Big Five correlations in ratings of a single rater (60–80%) are explained by s single evaluatively consistent bias factor (Anusic and Schimmack 2007). This factor is called Halo factor (H), based on Thorndike's (1920) seminal demonstration of evaluative biases in personality ratings. Furthermore, multi-trait-multi-method study of personality and CWB show higher same-method than cross-method correlations (Schimmack et al. 2004). These findings suggest that evaluative biases are not limited to personality ratings, but also influence ratings of CWB and AWB.

To control for the influence of evaluative biases on ratings of personality, AWB, and CWB, the present study for the first time explicitly modeled the shared variance among the Big Five with a higher order factor, and examines the influence of this factor on ratings of AWB and CWB. In addition, the causal model allowed for additional correlations between specific Big Five scales that have been found in previous studies, namely a relation between extraversion and openness and a relation between agreeableness and conscientiousness (see Fig. 1). These additional correlations are in part due to specific biases for these traits (Paulhus and John 1998) and in part due to valid covariations between these traits (DeYoung 2006).

1.3 Personality and AWB

Numerous studies have examined the relation between the Big Five and AWB. The common finding is that extraversion and neuroticism are the main predictors of AWB, whereas the other Big Five traits make a small or negligible contribution to AWB (Costa and McCrae 1980; Diener and Lucas 1999; Izard et al. 1993; Schimmack et al. 2002a, b). The most widely shared explanation for this finding is that extraversion and neuroticism reflect individual differences in the neurological processing of affective information. These biological processes are partially influenced by genetic factors, which can explain the high stability of AWB over time (Lykken and Tellegen 1996). In short, we expected to replicate previous findings that neuroticism and extraversion predict AWB.

1.4 Personality and CWB

The Big Five traits tend to be correlated with CWB in an evaluatively consistent manner. For Openness the correlation is no longer significant, after controlling for the shared

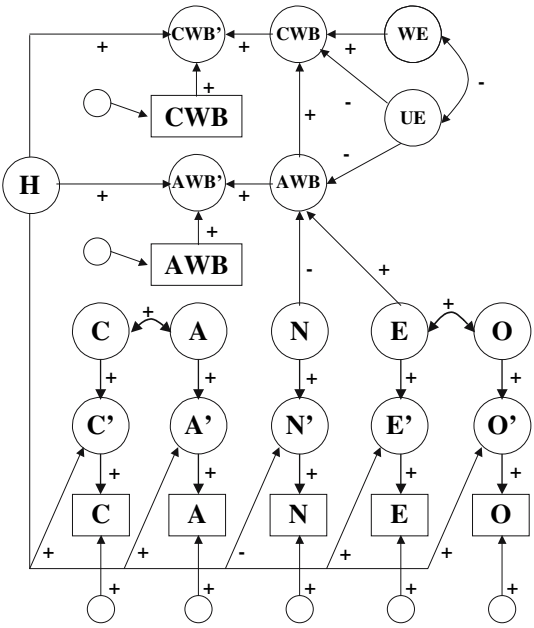

Fig. 1 Causal model of the effects of person factors (Big Five) and environmental factors on cognitive well-being and affective well-being. *Note*. N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, H = Halo, CWB = Cognitive well-being, AWB = Affective well-being, UE = Unemployment, WE = West-east, Squares = Observed variables with measurement error, Oval′ = latent corrected for random error, oval no′ = latent corrected for random error and halo effect)

variance between personality ratings, and neuroticism tends to be the strongest predictor (Heller et al. 2004; Schimmack et al. 2004). Furthermore, personality traits are no longer related to CWB when AWB is included as a predictor (Schimmack et al. 2002a, b). Sometimes, additional effects are observed, but they tend to be small. For example, in a student sample, Schimmack et al. (2002a) found a small effect of conscientiousness on CWB that was mediated by academic satisfaction.

1.5 Unemployment and Subjective Well-being

Unemployment is consistently negatively related to CWB (Frey and Stutzer 2002; Murphy and Athanasou 1999; Winkelmann and Winkelmann 1998). Cross-sectional studies cannot reveal the causal processes that produce this relationship. However, longitudinal studies demonstrate that most of the correlation is due to causal effects of unemployment on CWB (Lucas et al. 2004; Murphy and Athanasou 1999; Winkelmann and Winkelmann 1998). Previous studies also show that unemployment influences both AWB (Murphy and Athanasou 1999) and CWB (Frey and Stutzer 2002; Lucas et al. 2004; Winkelmann and Winkelmann 1998). So far no study has directly compared the effect sizes of unemployment on AWB and CWB, but individual effect sizes reported in previous studies suggest that unemployment has a stronger effect on CWB than on AWB. This pattern of findings suggests that unemployment has a direct effect on CWB that is not mediated by AWB.

The finding that unemployment is also related to AWB raises some interesting questions for Schimmack et al.'s (2002, b) mediator model. According to this model, AWB influences CWB, but CWB does not influence AWB. Thus, if unemployment has a direct (negative) influence on CWB, it should not have an indirect effect on AWB because the model does not assume an influence of CWB on AWB. Thus, a relation between unemployment and AWB could indicate that the mediator model needs to be revised.

Alternatively, it is possible that unemployment has a direct influence on AWB that is not mediated by its influence on CWB.

1.6 Regional Differences in Subjective Well-being

Previous studies have demonstrated regional differences in CWB between the formerly socialist Eastern part of Germany and the Western part of Germany (Frijters et al. 2004). Although these differences have been decreasing since unification of Germany in 1990, they have not been eliminated due to remaining inequalities between the East and West of Germany (e. g., income, unemployment rates). One limitation of previous studies is that conclusions about regional differences in happiness are based exclusively on comparisons of CWB. The present study examined whether there are any regional differences in AWB as well. One reason for regional differences in CWB, but not in AWB could be that reflective judgments are influenced by regional comparisons of standard of living between East and West Germans. In contrast, everyday experiences of affect are unlikely to be influenced by these types of social comparisons. Another reason for stronger regional differences in CWB than AWB is that some of the regional differences are due to regional differences in unemployment, and unemployment is a stronger predictor of CWB than AWB.

1.7 Unemployment, Region and Personality

A literature search revealed a marked absence of studies examining the relation between personality and unemployment. Thus, our study provides the first evidence from a national representative sample on this important issue. Unemployment could be related to personality for two reasons. First, personality traits could influence individuals' chances of employment. It is unlikely that this is the case for personality traits related to CWB because CWB is not a notable predictor of future employment status (Lucas et al. 2004; Winkelmann and Winkelmann 1998). Another possibility is that unemployment may change individuals' personality. However, personality traits are known to be very stable (Conley 1984) and to be more stable than CWB (Conley 1984; Fujita and Diener 2005). Thus, we predicted that unemployment has negligible effects on personality, and that effects of unemployment on CWB are not mediated by personality. We also did not expect regional differences in personality because the temporary separation of the two parts of Germany was probably too short to change stable personality traits.

Our hypothesis that unemployment and personality are independent is also consistent with the mediator model of SWB (Schimmack et al. 2002a). According to this model, personality influences CWB, but CWB does not influence personality. Therefore, influences of unemployment on CWB do not influence personality.

1.8 Relation among Unemployment and Region

Due to national representative sampling, and well-documented differences in unemployment between Eastern and Western parts of Germany, we expected unemployment and region to be related.

1.9 Summary of Predictions

Figure 1 summarizes the predictions about the causal relation among the variables. At the bottom, observed variance in the Big Five is decomposed into a random error component and a reliable component that does not contain variance due to random measurement error (e.g., the relation between observed neuroticism in the square and the latent variable N′). The reliable component is further decomposed into an evaluative part that is determined by an evaluative bias factor called halo factor (H) and a true personality component (latent N without ′). The same measurement model is used for AWB and CWB. The structural part of the model predicts effects of extraversion and neuroticism on AWB. In turn AWB influences CWB. In addition, unemployment has a direct influence on AWB and CWB, and region has a direct influence on CWB. The influence of region on unemployment is not modeled as a direct path due to statistical difficulties in modeling mediation with dichotomous variables (see Sect. 3 for more details).

2 Method

2.1 Procedure

The data were collected as part of the German Socio Economic Panel Study (SOEP; Wagner et al. 2007). The respondents had not participated on previous waves of the longitudinal SOEP. The sample was recruited using national probability sampling in the summer of 2006 (Schupp and Wagner 2007). A random-route sampling procedure (Thompson 2006) was used to contact participants for the study. A total of 1063 respondents aged 16–94 (representing 48% of contacted persons completed the personal interview. Sex, age cohort and educational levels were similarly distributed in this sample and in the German population. Data were collected by a professional high-quality fieldwork organization (Infratest Social Research, Munich) using computer assisted personal interview (CAPI). Results pertaining to other sections of this survey have already been published (Lang et al. 2007), but this is the first study of well-being in this data set. The data of 10 respondents were excluded due to missing data.

2.2 Materials

The questions used for this study are described in chronological order. Region was coded by the fieldwork organization and was not asked in the survey.

2.2.1 Unemployment

Question 6 asked whether respondents were currently registered officially as unemployed. Respondents answered no = 0 or yes = 1. One-hundred-eleven (10.5%) of respondents answered yes to this question. This percentage is consistent with the unemployment rate in Germany (Statistisches Bundesamt 2006).

2.2.2 Personality

After several unrelated questions, the next relevant questions assessed personality. The Big Five were assessed with question 33a–33o with three items for each trait. Responses were made on a 7-point scale ranging from 1 = does not describe me at all to 7 = describes me perfectly. The neuroticism items were "worry often," "get nervous easily," and (reversed) "relaxed, handle stress well." The extraversion items were "communicative, talkative, "outgoing and sociable," and (reversed) "reserved." The openness items were "original, produces new ideas," "artistic, values aesthetic experiences," and "vivid fantasy and imagination." The agreeableness items were (reversed) "sometimes somewhat harsh to other," "able to forgive," and "considered and friendly with others." The conscientiousness items were "work meticulously," (reversed) "rather lazy," and "completes tasks efficiently and effectively." A factor analysis revealed that all items had the highest loading on the intended factor. Internal consistencies of the three-item scales were 0.51 for neuroticism, 0.59 for extraversion, 0.67 for openness, 0.53 for agreeableness, and 0.67 for conscientiousness. These estimates are similar to estimates in a larger national representative sample of N = 21,105 respondents using the same questionnaire (Rammstedt 2007; N = 0.60, E = 0.66, O = 0.63, A = 0.51, C = 0.62). The reliability estimates based on the present sample were used in the measurement model of the structural equation model to estimate the amount of random error variance in personality predictors of well-being.

2.2.3 Affective Well-being (AWB)

On a random basis approximately half of the sample was asked to answer for the first time in a SOEP sample questions about AWB (N = 529). Thus, it was possible to examine whether questions about AWB influenced the subsequent rating of CWB. It also implies that tests of hypotheses involving AWB are based on half the sample (N = 523). AWB was assessed with five positive (relaxed, joyful, happy, pleasant, affectionate) and five negative items (unpleasant, sad, fearful, angry, worried). The time frame of the questions was the past year. Responses were made on a five-point scale ranging from very 1 = rarely to 5 = very often. The average of the five negative items was subtracted from the average of the five positive items to obtain a measure of AWB. The reliability of the AWB measure was assessed by randomly pairing negative and positive items and creating five AWB indicators by subtracting the negative item from the positive item. Chronbach's alpha for the five AWB indicators was alpha = 0.82. This value was used in the structural equation model to determine the amount of error variance in the AWB measure.

2.2.4 Cognitive Well-being

After several unrelated questions (e.g., do you have a car?), CWB was assessed with the standard life-satisfaction item in the SOEP (Wagner 2007) that is widely analyzed by psychologists, sociologists, and economists (Lucas et al. 2004; Ehrhardt et al. 2000; Frijters et al. 2004; Fujita and Diener 2005; Schimmack and Lucas 2007; Winkelmann and Winkelmann 1998). The item is an 11-point scale ranging from 0 = totally dissatisfied to 10 = totally satisfied. Although life-satisfaction is assessed with a single item measure, the SOEP panel data suggest a reliability of about .6 for participants in a panel study (Ehrhardt et al. 2000; Schilling 2006; Schimmack and Lucas 2007). Lower reliabilities in the first

waves suggest that this reliability estimate is inflated due to training effects. A study with the same item in a national representative sample that completed the measure for the first time found a 6 week retest correlation of $r = 0.55$ (Schimmack et al. 2007). Thus, a reliability estimate of 0.55 was used to determine the amount of error variance in CWB for the structural equation model.

3 Results

A first analysis examined whether the pattern of correlations differed between the respondents who also answered AWB questions and those who did not. We used a model with constrained correlation coefficients across the two groups. Overall model fit was evaluated on the basis of a variety of fit indices (Schermelleh-Engel et al. 2003). Acceptable fit requires a Comparative Fit Index (CFI) greater than 0.95, a Root Mean Square Error of Approximation (RMSEA) smaller than 0.06, and a Standard Root Mean Residual (SRMR) smaller than 0.08. A model with constrained variances and covariances fitted the data well, chi-square ($N = 1052$, $df = 55$) $= 64$, $p = 0.19$, CFI $= 0.991$, SRMR $= 0.035$, RMSEA $= 0.013$. The good fit of the constrained model shows that the relation between variables is the same in both samples. As a result, correlations were computed for the total sample, and only correlations for AWB are limited to the subsample of respondents who answered these questions (Table 1). To take full advantage of all available information, the structural equation model was tested using the missing data estimator in MPLUS4.2. As a result, parameter estimates are based on 1053 cases for all covariances except those involving AWB.

3.1 Structure of Personality

All 10 correlations among the Big Five ratings were statistically significant at the $p < 0.05$ significance level. As in previous studies, correlations were evaluativey consistent. The pattern of correlations is very similar to the pattern of correlations in a larger national representative sample using the same questionnaire ($N = 21{,}105$, Rammstedt 2007). In both studies, the E-O and the A-C correlations are the strongest correlations. A factor analysis demonstrated a strong first factor, and a weak second factor (Eigenvalues $= 1.95$, 1.02). This finding also replicates previous findings (Digman 1997; Anusic and Schimmack 2007). The factor loadings on the first unrotated factor were evaluatively consistent with a negative loading for neuroticism (-0.35), and positive loadings for extraversion (0.69), openness (0.68), agreeableness (0.61), and conscientiousness (0.73). The results are fully consistent with our hypothesis that an evaluative bias influences Big Five ratings. Importantly, neuroticism had a slightly weaker loading on the evaluative bias factor. This finding may be due to other biases that systematically influence neuroticism, and does not necessarily show that neuroticism scores are less biased.

3.1.1 Region and Personality

As expected, there were no notable differences in personality between respondents from the East or West.

Table 1 Correlations, means and standard deviations

	N	E	O	A	C	LS	UE	WE	AWB
N	–								
E	−0.20	–							
O	−0.11	0.41	–						
A	−0.08	0.16	0.19	–					
C	−0.11	0.29	0.30	0.43	–				
CWB	−0.19	0.19	0.14	0.16	0.22	–			
UE	0.06	0.03	−0.01	−0.02	−0.02	−0.24	–		
WE	0.05	−0.01	0.01	0.01	0.06	−0.13	0.19	–	
AWB	−0.44	0.20	0.04	0.09	0.16	0.42	−0.11	−0.03	–
Mean	3.95	4.86	4.72	5.42	5.67	7.15	0.10	0.20	3.42
SD	1.19	1.17	1.29	1.04	1.15	2.11	0.30	0.40	0.51

Note. N = Neuroticism, E = Extraversion, O = Openness to experience, C = Conscientiousness, A = Agreeableness, CWB = Cognitive wel- being, UE = Unemployment (0 = no, 1 = yes), WE = West (1) East (0), AWB = Affective well-being, CWB = Cognitive wel- being. N = 1053 for all correlations except correlations with AWB (N = 524)

3.1.2 Unemployment and Personality

Unemployment was not significantly correlated with personality traits, although the correlation for neuroticism approached significance. However, even after taking measurement error in neuroticism into account, the correlation remains below the 0.10 level for a small correlation (Cohen 1988). This finding has important theoretical implications for causal models of the relation between unemployment and SWB. The weak and non-significant correlations between unemployment and personality show that the correlation between unemployment and well-being is not due to a common effect of personality (e.g., neuroticism influences unemployment and well-being). It also shows that effect of unemployment on SWB is not mediated by personality. That is, unemployment does not lead to an increase in neuroticism, which in turn lowers SWB.

3.1.3 AWB and CWB

AWB and CWB are moderately correlated, $r = 0.42$. Even after adjusting this correlation for the reliability of the measures, the correlation suggests that AWB and CWB are distinct constructs, adjusted $r = 0.62$.

3.1.4 AWB and Personality

Simple correlations revealed significant relations of all Big Five traits with AWB. A regression analysis revealed that only neuroticism (standardized regression coefficient = −0.41) and extraversion (0.13) made a significant unique contribution to the prediction of AWB, and that neuroticism is a stronger predictor of AWB than extraversion. This finding replicates previous findings (Diener et al. 1999; Schimmack et al. 2002a).

3.1.5 CWB and Personality

All Big Five scales showed significant correlations with CWB, and all correlations were evaluatively consistent. Once more, this finding replicates previous studies, including a study of a large national representative sample (N = 21,105) with the same measures (Rammstedt 2007). A regression analyses showed that all traits except openness made a unique contribution to the prediction of CWB. A regression analysis that also included AWB as a predictor showed no significant direct effects of personality on CWB. This finding confirms the prediction that AWB mediated effects of personality on CWB, and that direct effects of personality traits on CWB tend to be negligible.

3.1.6 Unemployment and CWB

As predicted, unemployment was a significant negative predictor of CWB. The relation was significant in the total sample and in both sub-samples. It is also important to note the size of the effect. Although the correlation is roughly equivalent to the correlation with personality traits, the effect of unemployment on CWB is much stronger than the effect of individual personality traits for two reasons. First, the correlations with personality overestimate the effect because they are inflated by shared method variance. Second, correlations are inappropriate to compare effect sizes because unemployment is a dichotomous variable with unequal frequencies. In this case, it is more appropriate to compare the mean differences between employed and unemployed respondents to determine the effect size of unemployment (Cohen 1988). The standardized mean difference between employed and unemployed respondents is large, Cohen's $d = 0.77$. Importantly, this effect size measure does not yet take the large amount of random error in the CWB measure into account. The effect remained significant in a regression analysis that also included personality traits as predictors. This finding was to be expected given the non-significant correlations between personality and unemployment.

3.1.7 Unemployment and AWB

Unemployment had a significant negative relation to AWB. However, the effect size of this relation was considerably smaller than the effect size for CWB, $r = -0.10$, $d = 0.20$.

3.1.8 Region and CWB

The present study also replicated previous findings of regional differences in CWB. CWB was significantly higher in the West in the total sample and both sub-samples. Again, the correlation coefficient provides a misleading impression of the effect size of this difference. The standardized mean difference between East and West was moderate, $d = 0.31$.

3.1.9 Region and AWB

Unlike CWB, AWB was not related to region. This finding shows as expected that differences between East and West Germany are limited to CWB.

3.1.10 Unemployment and Region

As expected, unemployment was significantly related to region, indicating higher unemployment in the East than the West.

3.1.11 Causal Model

The covariance matrix was fitted to the theoretically specified model in Fig. 1, using MPLUS4.2. The missing value estimator was used so that correlations among variables other than AWB are based on N = 1053 observations, and correlations with AWB are based on N = 523. For measures of personality, AWB and CWB, a measurement model was used to remove the influence of measurement error on relations between latent variables. For personality measures, the measurement model was specified by fixing the path from the observed variable to the latent variable to the reliability as estimated with Chronbach's alpha. Because alpha is a standardized coefficient, non-linear constraints were used to impose a standardized constraint on unstandardized measures. For the endogenous variables CWB and AWB a different approach was used. In this case, error variances were fixed to the product of the observed variances and the amount of random error (1 − reliability). Due to the problems of testing indirect effects with dichotomous mediator variables, the relation between region and unemployment were not modeled as a causal effect of region on unemployment. Rather, the two variables were simply allowed to correlate. Based on the results of the exploratory factor analysis of the Big Five scores, the halo effects on extraversion, openness, agreeableness, and conscientiousness was constrained to be equivalent. The relation between neuroticism and halo was not constrained due to the lower factor loading in the exploratory factor analysis (Fig. 2).

The fit of the model was good, chi-square (df = 22) = 56, $p < 0.05$, AIC = 22,549, RMSEA = 0.037 (90%CI = 0.025–0.049), CFI = 0.965, SRMR = 0.031. The most surprising finding was that the path from extraversion to AWB was not significant, possibly due to the reduced power of testing relations with AWB due to the smaller sample size. This finding will be discussed in more detail in the discussion. All other effects were significant and consistent with predictions.

In the model shown, the effect of unemployment on CWB is underestimated because the model attributes some of the effect to the shared variance between region and unemployment although this shared variance should be allocated to unemployment. To address this problem, a model without region was tested as well. In this model, the standardized path coefficient between unemployment and CWB was −0.39, and the one for unemployment and AWB was −0.16.

3.2 Effect Sizes

So far, we have examined the relation between region and unemployment with other variables using correlations and covariances. Although this approach is statistically simpler and appropriate, it can produce misleading conclusions about effect sizes (Cohen 1988). The reason is that correlations with dichotomous variables are influenced by the strength of an association and the frequency of the two categories (i.e., employed versus unemployed). To obtain estimates of the effect size for an individual, it is necessary to use a different measure of effect sizes, Cohen's *d*.

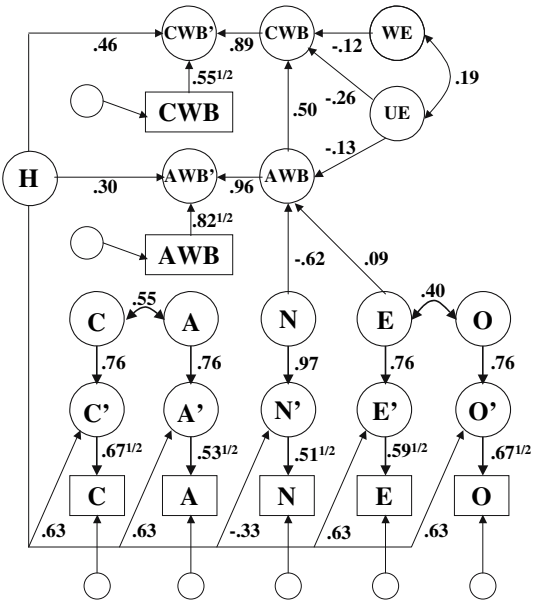

Fig. 2 Parameter estimates for causal model of the effects of person factors (Big Five) and environmental factors on cognitive well-being and affective well-being. *Note*. N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, H = Halo, CWB = Cognitive well-being, AWB = Affective well-being (square = observed, oval′ = latent corrected for random error, oval no′ = latent corrected for random error and halo effect), UE = Unemployment, WE = West-east. Parameter estimates for random error terms are not shown $(1 - \text{reliability})^{1/2}$

For neuroticism, effect sizes in d can be obtained by using the correlation between neuroticism and CWB implied in the causal model as a measure of r, and using a standard formula to transform r into d (Cohen 1988). The correlation between neuroticism and CWB corrected for halo effects is $r = -0.31$, which corresponds to an effect size of $d = 0.65$. This effect size estimate is smaller than the one in a recent meta-analysis of correlations between the Big Five and life satisfaction, $r = -0.42$, $d = 0.93$, that did not control for halo effects (Heller et al. 2004). To obtain an effect size for unemployment, it is easier to start with the mean difference in observed life satisfaction between employed and unemployed individuals, which produces an uncorrected effect size of $d = 0.77$. This effect size can be corrected for unreliability in the CWB measure (Bobko et al. 2001), which yields an effect size measure of $d = 1.04$. To obtain an effect size measure for the unique contribution of region, life satisfaction was first regressed on unemployment, and the residuals were retained. Based on regional differences in the residual variances, the uncorrected effect size was estimated to be $d = 0.20$, which implies a corrected effect size of $d = 0.27$. Thus, together unemployment and region have a stronger effect on CWB than neuroticism.

A different conclusion emerges for AWB. The effect sizes for neuroticism are $r = 0.62$, $d = 1.58$. The corrected effect sizes for unemployment and region are $d = 0.46$ and $d = 0.00$. In short, effect sizes show stronger effects of personality on AWB than on CWB, whereas unemployment and region have stronger effects on CWB than on AWB.

4 Discussion

This study of the determinants of AWB and CWB in a national representative sample makes several important contributions to well-being research. First, the study demonstrated for the first time that some variables are stronger predictors of AWB than CWB, whereas other variables are stronger predictors of CWB than AWB. We also demonstrated that

environmental factors such as unemployment and regional differences in Germany are stronger predictors of CWB than personality traits. In addition, the study replicated previous findings that neuroticism is a stronger predictor of AWB than CWB, and that personality traits are a stronger predictor of AWB than environmental factors; at least with regards to the personality and environmental factors included in this study. The demonstration of differential relations of personality and environment to AWB and CWB within a single study provides the strongest evidence yet that AWB and CWB are indeed different constructs.

In addition, the study demonstrated for the first time that a general evaluative factor in personality ratings and well-being judgments contribute to the observed correlations between personality ratings and SWB ratings. After controlling for the shared method variance, neuroticism was the only reliable predictor of AWB and CWB, despite the relatively large sample size. Subsequently, we discuss the implications of these findings, and point out limitations and directions for future research.

4.1 Cross-Sectional Data and Causality

A major limitation of the present study is that cross-sectional survey data cannot reveal causal processes. Even though our causal model fitted the data, it is likely that several alternative models would fit the data equally well, or even better. However, several assumptions about the hypothesized influences are strongly supported by additional findings in the literature. Most prominently, the effect of unemployment on CWB has been demonstrated in several studies (Lucas et al. 2004; Murphy and Athanasou 1999; Winkelmann and Winkelmann 1998). The East-West effect on CWB can also be safely interpreted as a causal effect. Although there has been migration mainly from the East to the West of Germany, the number of migrants is to small to suggest that migration of happy East Germans to West Germany accounts for the differences in CWB between Eastern and Western parts of Germany. Other aspects of the model are less well supported and need to be tested in future research.

4.2 The Affective and Cognitive Component of SWB

The distinction between AWB and CWB is more than 30 years old (Campbell 1976; Diener 1984). However, the importance of this distinction is often ignored in the science of happiness. Often studies using different measures are treated as if they all measured a single construct—called SWB or happiness. However, the present results provide strong evidence that happiness or SWB is a multidimensional construct with an affective component and a cognitive component. These components are related, but neither philosophical nor empirical identical.

The multi-dimensionality of SWB raises important and difficult questions for the use of subjective well-being measures (SWB) as subjective indicators in policy decisions. Based on the strong effect of unemployment on CWB, the reduction of unemployment is for very good reasons a prominent policy goal. Combined with the finding that unemployment rates are higher in East Germany, one could argue that sustained transfer of resources from West Germany to East Germany are justified to further reduce the regional differences in well-being. In contrast, the findings for AWB suggest different policy implications. There were no significant regional differences in AWB and the effect of unemployment on AWB was

weaker. Given the strong effect of neuroticism on AWB, and the finding that this link is mainly due to the depression component of neuroticism (Schimmack et al. 2004), funding for psychological and/or pharmacological treatments of depression might seem more important. Of course, both treatment and prevention of psychological problems and unemployment are recognized as important policy goals. However, the example illustrates that evaluations of the effectiveness of these policy goals depend on the choice of the well-being indicator. We would like to stress that this is merely an example to illustrate the theoretical implications of our findings, and that our findings do not have practical significance for policy decisions.

One limitation of our study is that AWB was assessed with a multi-dimensional 10-item scale, whereas CWB was assessed with a single life-satisfaction item. One-item measures are less reliable, which lowers observed correlations. In this regard, it is impressive that unemployment was more strongly correlated with CWB than AWB even before adjusting for unreliability. The main limitation of a single-item measure is that it is not possible to estimate random measurement error. Hence, we had to rely on evidence from other studies to estimate this parameter in our structural equation model. To the extent that our estimate is incorrect, effect sizes estimates may be too high or too low. However, there exist extensive evidence on the reliability of single-item well-being measures, and small deviations have a relatively small effect on parameter estimates. In addition, low reliability makes it more difficult to obtain precise parameter estimates of effect sizes. Future studies should replicate our findings with multiple-item scales in larger samples.

4.3 The Halo Factor and Well-being

Our study for the first time demonstrated that a higher-order factor that produces correlations among self-ratings of the Big Five is also correlated with AWB and CWB. Our model assumes that these correlations reflect shared evaluative biases in self-ratings of personality traits and SWB. However, an alternative explanation of the relation between the halo factor and the SWB measure could be that happy people are more likely to have a positive evaluative bias in their self-perceptions, or that biases about one's own attributes influence SWB. These alternative interpretations need to be examined in future research.

4.4 Personality and SWB

The results regarding personality and SWB replicate and extend previous findings. Previous studies demonstrated that neuroticism and extraversion are the main predictors of AWB, whereas the remaining Big Five traits do not contribute to AWB. The present study replicated this pattern. The results for extraversion need to be discussed in more detail. As in previous studies, extraversion was correlated with AWB, and extraversion was a positive predictor of AWB in the causal model. Although this correlation was not significant, it was in the expected direction and it would be a mistake to conclude from our findings that extraversion is not a predictor of AWB (Killeen 2005). Our results do suggest, however, that any causal effect is likely to be relatively weak. This conclusion may appear inconsistent with the literature, but the magnitude of the simple correlation in our study is consistent with those reported in seminal articles (Costa and McCrae 1980; Headey and Wearing 1989) and a meta-analysis (DeNeve and Cooper 1998). Furthermore, there is also evidence that correlations in previous studies were inflated by shared method variance. For

example, McCrae and Costa (1991) found correlations of $r = 0.25$ and 0.20 between self-ratings of AWB at Time 1 and Time 2 with self-rated extraversion at Time 3 in a longitudinal study. In contrast, correlations with informant ratings of extraversion at Time 3 were notably lower and not significant, $r = 0.09$ and $r = 0.04$. This finding cannot be attributed to unreliability or low validity of informant ratings of extraversion because the same study produced substantial self-informant agreement (Costa and McCrae 1988). Another problem is that previous studies sometimes based conclusions on observed correlations that failed to take correlations between extraversion and neuroticism into account (Costa and McCrae 1980). Vitterso (2001) found that the effect size of extraversion on SWB was considerably reduced after controlling for the shared variance in self-ratings of extraversion and neuroticism.

Additional factors may also influence the relation between extraversion and AWB. For example, the effect of extraversion on AWB in a national representative sample may be weaker because there is more variability in environmental factors (e.g., unemployment). Furthermore, stronger effects of extraversion on AWB may be found in student samples (Schimmack et al. 2002a, b) because extraversion may be more important for students to maximize AWB. Finally, it is also possible that cultural differences moderate the relation between extraversion and AWB (after all, Germans are known to be poets and thinkers not extraverts), although a small study with student samples found no evidence for this hypothesis (Schimmack et al. 2002b).

Finally, content overlap can explain the high correlations that are observed in some studies. Some extraversion scales include explicitly a Positive Emotion component (Costa and McCrae 1992). Not surprisingly, extraversion measures that include positive affect items are more highly correlated with AWB than the extraversion measure used in the present study (see Schimmack et al. 2004, for a comparison of extraversion facets). However, it is hard to argue that this correlation reflects a causal effect of extraversion on AWB. Indeed, some researchers have argued that a disposition to experience more positive affect is the core component of extraversion (Lucas et al. 2000). In short, our empirical findings regarding the relation between extraversion and AWB are fully consistent with previous empirical findings, and suggest that extraversion is not a strong unique predictor of AWB.

The results for CWB are also largely consistent with the literature. The main finding is that neuroticism is the strongest predictor (Heller et al. 2004; Vitterso 2001; Schimmack et al. 2004), and that the effect of neuroticism on CWB is mediated by AWB (Schimmack et al. 2002, b). Although the other Big Five traits sometimes seem to make a unique contribution to CWB (Heller et al. 2004), these relationships tend to be unreliable or weak when AWB or other variables are included as predictors. For example, in a large national representative sample ($N = 21{,}105$), the unique contribution of extraversion to life satisfaction remained non-significant, despite the large sample size (beta $= -0.02$; Rammstedt 2007).

4.5 Effect Sizes of Determinants of SWB

Another contribution of this study is the inclusion of personality and environmental predictors of SWB in the same study. It is difficult to compare effect sizes across studies due to sampling effects and differences in the reliabilities of SWB measures. Reviews of the literature often conclude that personality is a stronger predictor of SWB than environmental factors (Diener et al. 1999; McCrae 2002). The present results suggest that this

conclusion needs to be qualified in several ways. First, the present results suggest that the effects of personality and environment vary between CWB and AWB. Whereas our findings are consistent with the predominance of personality when AWB is used to assess SWB, it is not supported for CWB. Second, with regard to CWB the present study actually suggests that the effect of unemployment and regional differences in Germany are at least as strong as the effects of neuroticism. Furthermore, it is likely that additional environmental factors that were not assessed explain additional variance. In contrast, the Big Five are often considered a comprehensive descriptive framework for the assessment of personality. Thus, it is more difficult to conceive of additional personality predictors that can explain variance in AWB and CWB. Third, previous comparisons of effect sizes have relied on comparisons of explained variance. This approach is based in favor of continuous personality dimensions as opposed to heavily skewed dichotomous variables that reflect environmental factors such as unemployment, divorce, or disability. Finally, it is important to distinguish prediction and causality. Personality psychologists have yet to demonstrate that the relation between personality traits and well-being measures reflects a causal effect of personality on well-being. In contrast, longitudinal panel studies have already demonstrated that the effect of unemployment, divorce, and disability on CWB is causal (Diener et al. 2006).

4.6 Theories of Environmental Effects on CWB and AWB

Our findings regarding unemployment and CWB and AWB parallel findings for income, which also has a stronger effect on CWB than on AWB (Kahneman et al. 2006). Kahneman et al. (2006) interpreted this finding as a problem of CWB measures. They argue that people monetarily focus on income or unemployment when they are asked to judge life satisfaction. However, the empirical evidence shows these focusing effects are weak, and that people rely on chronically accessible information to judge CWB (Schimmack and Oishi 2005). We believe that it is more important to explain why AWB may be less responsive to environmental factors than CWB. One possible explanation for this pattern is that AWB is more strongly influenced by heritable affective dispositions (Lykken and Tellegen 1996; Schimmack et al. 2002a, b), whereas evaluations of one's live are more flexible and open to environmental and cultural influences (Suh et al. 1998). In other words, the *hedonic* treadmill is a more accurate metaphor for AWB than for CWB. In this regard, it is noteworthy that recent challenges of adaptation theory are exclusively based on CWB measures (see Diener et al. 2006, for a review).

5 Conclusion

The main contribution of this article is to provide further evidence that SWB is a multidimensional construct. The affective and the cognitive component of SWB reflect different philosophical theories of happiness. Affective well-being is the balance of positive versus negative affect. Cognitive well-being is an evaluative judgment. Although AWB and CWB are empirically related, they are not identical and show different relations to other variables. Maybe Campbell was just 30 years too early when he noted "we have come to the point where we must stop using the word happiness indiscriminately to refer to any aspect of experience we regard as positive" (p. 120).

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