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Postprint / Postprint
Zeitschriftenartikel / journal article

This is a post-peer-review, pre-copyedit version of an article published in
Journal of Happiness Studies, Vol. 19, 2018, No. 7, pp. 1883-1902
The final authenticated version is available online at: https://doi.org/10.1007/s10902-017-9901-y
Page numbers have been adjusted to the publishers version, whereby this postprint is fully quotable.

Mindful and Resilient? Incremental Validity of Sense of Coherence Over Mindfulness and Big Five Personality Factors for Quality of Life Outcomes

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Published online: 30 June 2017

Abstract Though conceptually distinct, mindfulness and sense of coherence (SOC) are empirically related aspects that promote health and wellbeing. The present research explored uniqueness by investigating criterion validity and incremental validity beyond the Big Five personality traits when predicting psychological distress, life satisfaction, and burnout. $N = 1033$ participated in a cross-sectional study. We used multiple regression analysis to examine the incremental validity of mindfulness (CHIME) and SOC (SOC-13) for psychological distress (SCL-K-9), life satisfaction (SWLS), and burnout (MBI-GS scales: emotional exhaustion, cynicism, personal accomplishment). Mindfulness and SOC had incremental validity over the Big Five traits. Despite a strong overlap (45% shared variance) between mindfulness and SOC, SOC was always the stronger predictor: psychological distress ($\beta = -.52$), life satisfaction ($\beta = .57$), emotional exhaustion ($\beta = -.23$), cynicism ($\beta = -.40$), and personal accomplishment ($\beta = -.30$). For psychological distress, life satisfaction, and cynicism, SOC statistically explained almost all the criterion validity of mindfulness. The clinical utility of mindfulness for predicting psychological health appears to be of minor importance relative to SOC, regardless whether meditators or non-meditators, who differed in mindfulness, were analyzed. Western approaches to assessing mindfulness may lack crucial social and existential dimensions.

Keywords Sense of coherence • Mindfulness • Big Five • Psychological distress • Life satisfaction • Burnout

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1 Introduction

Recent research has advanced mindfulness as an important predictor of psychological well-being (Brown and Ryan 2003; Eberth and Sedlmeier 2012). Mindfulness has been conceptualized as a quality of consciousness characterized by a receptive, open state of mind. It has been defined as "paying attention in a particular way: on purpose, in the present moment, nonjudgmentally" (Kabat-Zinn 1994, p. 4). Attention towards the present moment should go together with an accepting, affectionate, and nonjudgmental attitude (Bishop et al. 2004; Shapiro et al. 2006). The present study examines whether mindfulness covers unique aspects compared to personality, and sense of coherence in particular, which might account for the relationships with psychological health, satisfaction with life, and burnout.

1.1 Mindfulness and Its Relationship to Well-Being

Rooted in Buddhist philosophy and practices, secular interventions have been established aiming to increase mindfulness and in turn improve stress management (mindfulness based stress reduction, MBSR; Davis and Hayes 2011; Kabat-Zinn 1990, 2003), improve emotion-regulation skills (dialectical behavior therapy, DBT; Linehan 1993a, b), or help in the treatment of recurrent depression (mindfulness based cognitive therapy, MBCT; Segal et al. 2002). Mindfulness is beneficial for mental health (i.e. depression, anxiety), well-being, and many other aspects of psychological and physical health (Brown and Ryan 2003; Brown et al. 2007). Thus, mindfulness can be understood as a functional and beneficial way to relate to events and conditions, in turn leading to health promoting skills and behaviors. This view of mindfulness partly overlaps with the concept of resilience or inner strength (Lindström 2001; Windle 2011), requiring an investigation of the unique aspects of mindfulness. Rather than focusing on disease, resilience highlights aspects of personality that are beneficial for one's health, buffering against stress in times of hardships and critical life events.

Despite a multitude of clinical applications, the operationalization and conceptual extensiveness of mindfulness has been discussed vigorously. Based on its origins, mindfulness is only truly defined for those who practice it. This can create difficulties with regard to the operationalization as a measurable construct. In most cases, attention and awareness of the moment-to-moment experience are considered an overall key factor (Brown and Ryan 2004). However, Grossman (2011) argued that researchers need to turn thorough attention towards the original Buddhist conception of mindfulness. In the Buddhist tradition mindfulness goes beyond attention or awareness to the present moment but inherently includes contextual and ethical aspects. There is considerable debate about the core elements of the mindfulness construct (Hanley et al. 2016). There are a multitude of ways to understand mindfulness. A number of practices or interventions are supposed to promote mindfulness as a state of being. Regular practice and engagement should then promote a more mindful disposition. Eventually, mindfulness can be understood as a general human characteristic, akin to an aspect of personality, allowing for the measurement of inter- and intrapersonal variations in mindfulness (Brown and Ryan 2003).

To address these issues, more comprehensive inventories have been created to measure mindfulness as a multidimensional trait-like construct. Baer and colleagues constructed the Five-Facet Mindfulness Questionnaire (FFMQ; Baer et al. 2006, 2008) by factor analyzing five existing inventories: the Freiburg Mindfulness Inventory (FMI; Walach et al. 2006),

the Mindful Attention Awareness Scale (MAAS; Brown and Ryan 2003), the Kentucky Inventory of Mindfulness Skills (KIMS; Baer et al. 2004), the Cognitive and Affective Mindfulness Scale (CAMS; Feldman et al. 2007), and the Mindfulness Questionnaire (MQ; Chadwick et al. 2008). However, different factor models best fit the data in various samples. Most critically, differences between samples with and without meditation experience emerged, hinting at a lack of measurement invariance (Baer et al. 2006; Williams et al. 2014).

Recently, the Comprehensive Inventory of Mindful Experience (CHIME; Bergomi et al. 2013, 2014) has been developed, based on Bishop et al. (2004) two-component conceptualization of mindfulness: (1) self-regulation of attention towards the present, and (2) an orientation comprising curiosity, openness, and acceptance. Considering mindfulness as a quasi-trait and a "general human capacity occurring in daily life" (Bergomi et al. 2013; p. 21), the authors aimed at covering all appropriate aspects of mindfulness using eight established mindfulness scales as a basis including the MAAS, CAMS-R, KIMS, FMI, FFMQ, but also the Southampton Mindfulness Questionnaire (SMQ; Chadwick et al. 2008), Philadelphia Mindfulness Scale (PHLMS; Cardaciotto et al. 2008), and the Toronto Mindfulness Scale (TMS; Lau et al. 2006). Items were modified to be understandable and applicable to the general population, specifically to non-meditators. The authors reported a complex factor-structure with a global mindfulness second order factor and eight subfactors. Despite the complexity, this model fit the data well for both meditators as well as the general population, and there were no hints at differential item functioning (DIF) across age, sex, or meditation experience. Even though other measures (such as the FFMQ) showed promising signs of validity, there may still be room for improvement. The inclusive CHIME contains additional facets not covered by the FFMQ, and it proved to be incrementally valid compared to the FFMQ when predicting psychological distress and wellbeing (Bergomi et al. 2014).

Meta-analytically, mindfulness has been consistently associated with various factors of the Big Five personality model. Most dominantly, mindfulness is generally negatively correlated with neuroticism (mean true score correlation $\rho = -.58$), and positively connected to conscientiousness ($\rho = .44$) and agreeableness ($\rho = .30$) (Giluk 2009). Recently, mindfulness has been found as both a moderator and a mediator of the relationships between aspects of neuroticism or perceived stress and specific measures of health and well-being (Bränström et al. 2011; Iani et al. 2017). The Big Five model is one of the most popular general models of personality. Most notably, neuroticism is associated with various aspects of physical and mental health, ranging from mood disorders to schizophrenia on the one hand and mortality from cardiovascular disease, coronary heart disease, or cancer on the other hand (Charles et al. 2008; Lahey 2009; Ormel et al. 2013). In the Fukuoka cohort study (>11,000 Japanese participants), neuroticism was mostly associated with higher perception of stress, poorer perceived health, and lower satisfaction with life, but also with BMI and physical activity (Otonari et al. 2012). Specifically, mindfulness has been considered a prime characteristic for preventing burnout, e.g., due to work-related stress (Charoensukmongkol 2016; Taylor and Millear 2016).

Yet, mindfulness is rarely compared to other aspects of personality that are supposed to be beneficial for one's health. In light of a range of psychotherapy approaches focusing on mindfulness, this begs the question: Does mindfulness actually capture unique criterion variance beyond competing constructs? Rather than investigating mere bivariate correlations, we will examine mindfulness's incremental validity over competing psychological constructs for predicting mental health.

1.2 Sense of Coherence as a Salutogenic Competitor to Mindfulness

One of the most popular concepts of resilience is Antonovsky's salutogenic theory (Antonovsky 1979, 1987). In a salutogenic view, health is not just the absence of disease, but resides at one end of a continuum between health and disease. Sense of coherence (SOC) promotes the development and sustainment of health. It buffers health when people are faced with hardships and stressful life events. SOC is theoretically constituted by three components. *Comprehensibility* describes an individual's perception that situations and events are structured and clear; *manageability* captures an individual's belief that she has the necessary skills to deal with life's challenges. Finally, *meaningfulness* depicts an individual's belief that the demands and challenges of life are worthy of investment and engagement. Stability of inter-individual differences over up to ten years has been shown with test–retest correlations ranging between .54 and .78 (Eriksson and Lindström 2005; Grevenstein and Bluemke 2015b). According to Antonovsky, the development of SOC is a dynamic process shaped by external factors up to age 30. Experiencing consistency (enhancing comprehensibility), load-balancing (enhancing manageability), and participation in decision-making (enhancing meaningfulness) are all thought to foster SOC in childhood/adolescence (Antonovsky 1987).

Despite different developmental conceptions and theoretical backgrounds, SOC and mindfulness have shown strikingly similar empirical associations. Like mindfulness, SOC has been related to health and health behavior many times (Eriksson and Lindström 2006). SOC predicted general psychological wellbeing (Nilsson et al. 2010), satisfaction with life (Pallant and Lae 2002; Moksnes et al. 2013b; von Humboldt et al. 2014), burnout (Randler et al. 2015), depression (Eriksson et al. 2007; Haukkala et al. 2013), and anxiety (Moksnes et al. 2013a). SOC has also shown considerable associations with the Big Five traits. A strong negative relation to neuroticism is most characteristic (r = -.56 to -.85), although smaller, positive correlations to extraversion (r = .37 to .43), conscientiousness (r = .31 to .37), and agreeableness (r = .18 to .40) have also been reported (Feldt et al. 2007; Hochwälder 2012). Nonetheless, SOC has shown incremental validity over all of the Big Five traits when predicting psychological distress and satisfaction with life (Grevenstein and Bluemke 2015a).

1.3 Relationship between Mindfulness, Sense of Coherence, Big Five, and Mental Health

Just like SOC, mindfulness is believed to help in understanding and coping with external events and one's own emotions promoting self-awareness and self-regulation (Chambers et al. 2009; Vago and Silbersweig 2012; Weinstein et al. 2009). Thus the conception of mindfulness is reminiscent of SOC's comprehensibility and manageability facets. Consequently, a number of studies have established substantial relationships of mindfulness and SOC with personality, and both constructs showed similar predictive validity for various criteria (e.g., Feldt et al. 2007; Giluk 2009; Grevenstein and Bluemke 2015a; Hanley et al. 2016). However, none of the previous studies has examined the uniqueness of mindfulness and SOC for predicting mental health, satisfaction with life, and burnout. In fact, this type of analysis informs us about incremental validity, which might clarify whether mindfulness and SOC are conceptually exchangeable or not. It could well be that both are indeed highly related constructs, if only on the basis of fundamental personality characteristics with which both constructs overlap. If they shared a substantial amount of

variance already at the construct level, this would explain their similar predictive validity for health criteria as well. We chose to settle the question on their relatedness and their predictive capabilities by running a neck-to-neck comparison of both measures for predicting criteria that either have been predicted by SOC before (psychological distress, life satisfaction), or that should give mindfulness a specific advantage to display its strengths for buffering against stress (i.e., preventing burnout). The present research aims to directly compare mindfulness, SOC, and the Big Five traits regarding their criterion validity. We hypothesize that mindfulness and SOC possess incremental validity beyond the Big Five traits. Yet we propose that SOC, given its favorable track record (Eriksson and Lindström 2006; Grevenstein and Bluemke 2015a; Grevenstein et al. 2016b), will still add explained variance beyond all other predictors and account for at least some of mindfulness' criterion validity as well. Several health relevant criteria will be used: psychological symptoms, satisfaction with life, and burnout. Satisfaction with life has long been identified as an aspect of mental and physical health (Strine et al. 2008). Burnout, due to it close relationship with depression, is also consistently counted as a major health issue (Bianchi et al. 2015).

2 Methods

2.1 Procedure and Participants

The data were collected in an online study advertised as a "study on compassion, empathy, personality, and health". The sample included 1033 individuals (M_{age} = 41.83 years, SD_{age} = 14.14). Recruitment took place via e-mail lists, and flyers handed out locally all over town. To increase the generalizability of our findings, a prominent social media site (i.e., Facebook) was used to recruit a broader range of German-speaking participants. To broaden the sample, we invited meditation-inclined people associated with the "Tibethaus", a Buddhist center in Frankfurt am Main (Germany; http://www.tibethaus.com/en/) to participate as well.

In some cases, differences between people who actually practice mindfulness meditation and general population samples have been shown (Van Dam et al. 2009; Belzer et al. 2013). One possible explanation may be that mindfulness relies on introspective practices that are potentially undeveloped in most inexperienced individuals (Grossman 2008). The mindfulness scale we used explicitly aims to measure mindfulness equally well in both meditators and non-meditators. Nonetheless, recruiting a reasonable number of meditators was still recommended to argue that the concept of mindfulness was adequately captured and to ensure sufficient variance on the mindfulness measure. Thus, apart from recruiting a general population sample, we additionally contacted via the "Tibethaus" meditation centers, Buddhist organizations, and meditation- or yoga-related groups. As a result, 37.8% of all participants indicated regularly practicing some form of meditation. Meditators had an average 11.67 (SD = 9.79) years of meditation experience. Participants were well-educated, with 8.4% basic schooling (n = 87), 32.1% high school degrees (n = 332), and 59.4% university level degrees (n = 614). The sample was less balanced in terms of genders: n = 777 female (75.2%), n = 256 male (24.8%). Participants were informed about the study goals, that participation was completely voluntary, and that they could drop out any time. Participants provided informed consent and only data provided by participants who completed the entire survey were analyzed. The survey software reminded

participants to respond in case of missing values, so there were no missing data. At the end of the study participants could participate in a lottery for compensation. The study was approved by the ethics committee of the university hospital Heidelberg (S-114/2015).

2.2 Measures

2.2.1 CHIME: Mindfulness

We used the German language Comprehensive Inventory of Mindfulness Experiences (CHIME) to measure trait mindfulness (Bergomi et al. 2014). It includes 37 items comprising eight facets: (1) *awareness towards inner experiences*; (2) *awareness towards outer experiences*; (3) *acting with awareness, being present*; (4) *accepting, non-judgmental and compassionate orientation*; (5) *non-reactive and decentered orientation*; (6) *openness to experience*; (7) *relativity of thoughts*; and (8) *insightful understanding*. Sample items include "I immediately realize when my mood changes" and "I see my mistakes and difficulties without judgment". Answers were given on 6-point scales (labeled from 1 = *almost never* to 6 = *almost always*). We computed mean scores for the whole scale (Cronbach's Alpha = .93).

2.2.2 SOC-13: Sense of Coherence

We used a German adaptation of Antonovsky's original 13-item Orientation to Life scale (Schumacher et al. 2000a, b). It includes four meaningfulness items (e.g., "Do you have the feeling that you don't really care about what goes on around you?"), five comprehensibility items (e.g., "Has it happened in the past that you were surprised by the behavior of people whom you thought you knew well?"), and four manageability items (e.g., "Has it happened that people whom you counted on disappointed you?"). Answers were given on 7-point scales (labeled from 1 = *very rarely* to 7 = *very often*). Mean scores were computed (Alpha = .81).

2.2.3 BFI-S: Big Five

Basic personality traits were measured using the German 15-item Big Five Inventory (Gerlitz and Schupp 2005), an abbreviated version of the original BFI (John et al. 1991). Each dimension is measured with three items, all starting with the introduction "I see myself as someone who…", for instance, "gets nervous easily" (Neuroticism; N), "is talkative" (Extraversion; E), "is inventive" (Openness to experience; O), "is considerate and kind to almost everyone" (Agreeableness; A), and "does a thorough job" (Conscientiousness; C). Answers were given on 7-point rating scales ranging from 1 = *no, do not agree at all* to 7 = *yes, totally agree*. Mean scores were computed for each trait. Reliabilities were mostly satisfactory to good, with Alphas of α_N = .77, α_E = .78, α_O = .63, α_A = .56, and α_C = .63. Even though some Alphas are lower than may be ideal, internal consistencies mirror the range of Alphas reported by the original authors.

2.2.4 SCL-K-9: Psychological Distress

Psychological symptoms during the last seven days were assessed with the Symptom Checklist-K-9 (Klaghofer and Brähler 2001). It is a brief 9-item version of the original

ninety-item SCL-90-R (Derogatis and Fitzpatrick 2004) and captures a wide range of psychopathological symptoms, such as depression (e.g., “In the last seven days, how much did you suffer from a feeling that you had to worry too much?”). The SCL-K-9 represents a subset of items from the SCL-90-R. From each of the nine SCL-90-R subscales, one item with the highest item-to-total correlation was selected. Consequently, the SCL-K-9 has been presented as a convergently valid measure with a correlation of $r = .93$ between the short SCL-K-9 and the full SCL-90-R global severity index in a representative survey (Klaghofer and Bra¨hler 2001). Answers were provided on 5-point scales (0 = *symptom not present*; 4 = *experienced distress induced by the symptom very high*). Mean scores were computed (Alpha = .87).

2.2.5 SWLS: Satisfaction with Life

The Satisfaction With Life Scale (SWLS) is a succinct 5-item measure of a global judgment of satisfaction with one’s own life (Diener et al. 1985). The scale is known to be a reliable and valid measure across diverse samples (Diener et al. 2013). A German adaptation was provided by Glaesmer et al. (2011). Items include “In most ways my life is close to my ideal” and “I am satisfied with my life”. Answers were given on 7-point scales (1 = *strongly disagree*; 7 = *strongly agree*) and aggregated to a mean score (Alpha = .89).

2.2.6 MBI-GS: Burnout

The Maslach Burnout Inventory-General Survey (MBI-GS) is a commonly used 16-item measure of burnout, applicable in all work place contexts (Schaufeli et al. 1996). We used the German version provided by Büssing and Glaser (1998). It measures symptoms of burnout in three subscales, yielding three separate scores for emotional exhaustion (EE), cynicism (CY), and personal accomplishment (PA). Sample items include “I feel burned out from my work” (EE), “I doubt the importance of my work” (CY), and “I have accomplished many worthwhile things in this job” (PA). Answers were given on 6-point scales labeled from 1 = *never* to 6 = *very often*. Cronbach’s Alpha amounted to .85, .83, .82 for EE, CY, and PA, respectively.

2.3 Statistical Analysis

SPSS 22 was used for all analyses. We conducted several multiple regression analyses and entered predictors at four different stages. Nominally scaled variables were coded as follows: sex (0 = *female*; 1 = *male*), education (1 = *basic schooling*; 2 = *high school*; 3 = *university level*), meditation practice (0 = *no*; 1 = *yes*). Step 1 included all demographic variables; step 2 added the Big Five traits; step 3 added mindfulness; step 4 added SOC. Multicollinearity was not an issue according to the tolerance measure and the variance inflation factor, all VIFs <2.43. Whereas Cohen (1992) recommended considering *r*s of .10, .30, and .50 as small, medium, and large in magnitude, respectively, recent recommendations suggest interpreting *r*s of .10, .20, and .30 as relatively small, typical, and relatively large in the domain of individual differences (Gignac and Szodorai 2016).

3 Results

3.1 Initial Data Analysis

Women scored significantly higher than men on neuroticism, extraversion, conscientiousness, as well as emotional exhaustion and personal accomplishment (Table 1). Most noteworthy, meditators differed substantially from non-meditators in that meditators were older and reported substantially higher mindfulness. Meditators also reported higher SOC, openness to experience, conscientiousness, agreeableness, satisfaction with life, and personal accomplishment. Additionally, their scores on neuroticism, emotional exhaustion, and cynicism were significantly lower. Apparently, meditation was closely connected to better health and quality of life. Zero-order correlations indicated that mindfulness and SOC were closely related, sharing 45% of their variance. Both also had various relationships with several of the Big Five traits, most dominantly neuroticism (Table 2). Based on these results, we included participants' sex, age, level of education, and whether they reported practicing meditation regularly in the following analyses.

3.2 Incremental Validity of Mindfulness and SOC Over and Beyond the Big Five

Table 3 displays results for the multiple regression analyses. After accounting for sociodemographic variables (step 1), all criteria could be predicted—to a varying degree—by the Big Five traits (step 2). As expected, neuroticism stood out as the most important trait when predicting psychological distress, life satisfaction, and emotional exhaustion. Cynicism and personal accomplishment had diverse associations with many traits.

In the next step (step 3), we added mindfulness to investigate incremental validity. Mindfulness explained 1–3% of additional variance beyond all of the Big Five traits in the criteria. For life satisfaction, cynicism, and personal accomplishment, mindfulness was the predictor with the largest unique predictive strength at this step.

Finally, we added SOC (step 4) to explore whether the increment of mindfulness would still hold when compared to an established concept of resilience. Adding SOC increased the explained variance by 2–14% of additional variance, and SOC was a significant predictor of all five criteria. With the exception of emotional exhaustion, SOC was the strongest predictor of all criteria; that is, it contributed the largest unique variance. Mindfulness even failed to reach significance next to SOC for psychological distress, life satisfaction, and cynicism. In these cases, all the criterion validity of mindfulness was also captured by SOC. Then again, mindfulness could still significantly predict emotional exhaustion and personal accomplishment, yet with its b-weights severely reduced. We used a reverse elimination strategy to see how much variance could still be explained when mindfulness was removed as a predictor. There was no significant decrease of explained variance for psychological distress (R^2 = .56; F(10,1022) = 128.60; p_{change} = .229), satisfaction with life (R^2 = .45; F(10,1022) = 82.33; p_{change} = .130), and cynicism (R^2 = .34; F(10,1022) = 52.22; p_{change} = .185). Criterion prediction was very slightly, but significantly decreased for emotional exhaustion (R^2 = .34; F(10,1022) = 52.55; p_{change} = .038) and personal accomplishment (R^2 = .41; F(10,1022) = 71.24; p_{change} < .001).

In a multiple regression analysis, the resulting betas are unique semi-partial regression weights, which are difficult to interpret. We computed the joint variance (Schoen et al.

Table 1 Sample characteristics and difference tests (gender, meditation practice) for study variables

	Total ($N = 1033$) *M (SD)*	Men ($n = 256$) *M (SD)*	Women ($n = 777$) *M (SD)*	*d*	Meditators ($n = 390$) *M (SD)*	Non-meditators ($n = 643$) *M (SD)*	*d*
Age	41.83 (14.14)	44.20 (14.40)	41.05 (13.97)	.22**	47.27 (11.20)	38.54 (14.71)	.67***
Mindfulness (CHIME)	4.31 (0.60)	4.35 (0.60)	4.30 (0.61)	.08	4.58 (0.54)	4.15 (0.58)	.77***
Sense of Coherence (SOC)	5.14 (0.92)	5.16 (0.95)	5.13 (0.91)	.03	5.36 (0.84)	5.00 (0.94)	.40***
Neuroticism (N)	3.72 (1.36)	3.38 (1.37)	3.83 (1.34)	.33***	3.32 (1.29)	3.97 (1.34)	.49***
Extraversion (E)	4.82 (1.26)	4.52 (1.28)	4.92 (1.24)	.32***	4.78 (1.26)	4.84 (1.27)	.05
Openness (O)	5.46 (1.07)	5.41 (1.07)	5.48 (1.07)	.07	5.65 (1.01)	5.35 (1.09)	.29***
Conscientiousness (C)	5.39 (1.03)	5.22 (1.11)	5.45 (1.00)	.22**	5.55 (0.96)	5.30 (1.06)	.25***
Agreeableness (A)	5.48 (0.94)	5.44 (1.00)	5.50 (0.92)	.06	5.61 (0.84)	5.41 (0.98)	.22**
Psychological distress (SCL-K-9)	1.75 (0.67)	1.69 (0.66)	1.77 (0.67)	.12	1.63 (0.62)	1.83 (0.69)	.30***
Life Satisfaction (SWLS)	5.33 (1.14)	5.24 (1.20)	5.36 (1.12)	.10	5.45 (1.15)	5.25 (1.13)	.18**
MBI emotional exhaustion	3.08 (1.01)	2.92 (1.02)	3.13 (1.01)	.21**	2.95 (1.05)	3.16 (0.98)	.21**
MBI cynicism	2.32 (0.99)	2.40 (1.02)	2.30 (0.98)	.10	2.19 (0.97)	2.41 (1.00)	.22**
MBI personal accomplishment	5.11 (0.63)	5.02 (0.68)	5.14 (0.62)	.18**	5.24 (0.59)	5.03 (0.65)	.34***

Groups differ significantly at * $p < .05$; ** $p < .01$; *** $p < .001$, with *d* as Cohen's effect size

Table 2 Correlations of mean scores of study variables

	Age	Sex	Edu	Medit	CHIME	SOC	N	E	O	C	A	SCL	SWLS	MBI-EE	MBI-CY
Age	–														
Sex	.10**	–													
Education (Edu)	.23***	.02	–												
Meditation practice (Medit)	.30***	.07*	.02	–											
Mindfulness (CHIME)	.46***	.04	.10**	.35***	–										
Sense of Coherence (SOC)	.43***	.02	.16***	.19***	.67***	–									
Neuroticism (N)	-.35***	-.14***	-.05	-.23***	-.59***	-.61***	–								
Extraversion (E)	.01	-.14***	-.01	-.02	.22***	.21***	-.16***	–							
Openness (O)	.12***	-.03	-.02	.14***	.34***	.12***	-.13***	.25***	–						
Conscientiousness (C)	.17***	-.10**	.05	.12***	.35***	.37***	-.26***	.17***	.11***	–					
Agreeableness (A)	.10**	-.03	-.02	.10**	.37***	.35***	-.23***	.07*	.20***	.17***	–				
Psychological distress (SCL)	-.40***	-.05	-.18**	-.14***	-.54***	-.72***	.58***	-.13***	-.08*	-.29***	-.24***	–			
Life Satisfaction (SWLS)	.17***	-.04	.13***	.09**	.47***	.64***	-.41***	.26***	.16***	.29***	.28***	-.48***	–		
MBI emotional exhaustion	-.27***	-.09**	.01	-.10**	-.44***	-.50***	.52***	-.18***	-.10**	-.24***	-.19***	.48***	-.41***	–	
MBI cynicism	-.27***	.04	-.10**	.11**	-.44***	-.55***	.37***	-.23***	-.18***	-.27***	–.29***	.50***	-.52***	.58***	–
MBI personal accomplishment	.34***	-.08**	.14***	.16***	.52***	.55***	-.35***	.25***	.25***	.41***	-.29***	-.46***	-.50***	-.38***	-.59***

Correlations are significant at * $p < .05$; ** $p < .01$; *** $p < .001$

Table 3 Prediction of study criteria by Big Five personality factors, mindfulness, and SOC in multiple regression analyses

	Psychological Distress (SCL-K-9)			Life Satisfaction (SWLS)			MBI emotional exhaustion			MBI cynicism			MBI pers. accomplishment		
	$\beta_{Step\ 2}$	$\beta_{Step\ 3}$	$\beta_{Step\ 4}$	$\beta_{Step\ 2}$	$\beta_{Step\ 3}$	$\beta_{Step\ 4}$	$\beta_{Step\ 2}$	$\beta_{Step\ 3}$	$\beta_{Step\ 4}$	$\beta_{Step\ 2}$	$\beta_{Step\ 3}$	$\beta_{Step\ 4}$	$\beta_{Step\ 2}$	$\beta_{Step\ 3}$	$\beta_{Step\ 4}$
Step 1: Demographics															
Age	-.21***	-.16***	-.09***	-.01	-.07*	-.14***	-.12***	-.09**	-.06	-.14***	-.10**	-.05	.20***	.14***	.10***
Sex	.02	.01	.00	-.05	-.05	-.03	-.05	-.05	-.06*	.05	.05	.04	-.07**	-.07**	-.06*
Education	-.11***	-.10***	-.06*	.12***	.11***	.07*	.06*	.06*	.08*	-.05	-.05	-.02	.09**	.08**	.06*
Meditation practice	.05	.08**	.05*	-.02	-.06*	-.02	.05*	.08**	.07*	.06	.06	.03	.01	-.03	-.01
Step 2: Big 5															
Neuroticism (N)	.46***	.37***	.22***	-.32***	-.21***	-.04	.43***	.37***	.30***	.23***	.15***	.03	-.15***	-.05	.04
Extraversion (E)	-.04	-.02	.02	.16***	.13***	.09***	-.10***	-.08**	-.07*	-.14***	-.12***	-.09**	.14***	.11***	.09***
Openness (O)	.04	.08**	.03	.04	-.01	.05	.00	.03	.01	-.05	-.01	-.06*	.11***	.06*	.10***
Conscientiousness (C)	-.12***	-.08**	-.02	.14***	.10***	.04	-.09**	-.07*	-.05	-.12***	-.09**	-.04	.26***	.23***	.20***
Agreeableness (A)	-.10***	-.05**	.02	.17***	.12***	.04	-.06*	-.03	.00	-.19***	-.15***	-.10**	.16***	.11***	.07**
Step 3: Mindfulness															
Mindfulness (CHIME)		-.24***	-.04		.28***	.06		-.17***	-.09*		-.21***	-.06		.26***	.15***
Step 4: Sense of coherence															
Sense of coherence (SOC)			-.52***			.57***			-.23***			-.40***			.30***
F	82.11	82.95	117.09	43.86	46.37	75.15	50.39	48.19	48.32	38.84	38.51	47.67	62.13	63.43	66.89
df	9,1023	10,1022	11,1021	9,1023	10,1022	11,1021	9,1023	10,1022	11,1021	9,1023	10,1022	11,1021	9,1023	10,1022	11,1021
R^2	.42	.45	.56	.28	.31	.44	.31	.32	.34	.26	.27	.34	.35	.38	.41
ΔR2 from previous step	.25	.03	.11	.24	.03	.14	.22	.01	.02	.18	.02	.07	.22	.03	.04

Beta weights are significant at * $p < .05$; ** $p < .01$; *** $p < .001$. Results for regression step 1 with demographics only are not shown

2011) between SOC and mindfulness for the prediction of psychological distress (R^2_{joint} = .09), satisfaction with life (R^2_{joint} = .05), emotional exhaustion (R^2_{joint} = .10), cynicism (R^2_{joint} = .08), and personal accomplishment (R^2_{joint} = .13). The unique contribution of SOC was larger than the joint variance between SOC and mindfulness for psychological distress, life satisfaction, and cynicism. The joint variance was larger for emotional exhaustion and personal accomplishment, mirroring the reduced unique predictive power of SOC.

3.3 Additional Analyses

We additionally conducted some exploratory analyses to examine if the predictive strength of SOC could be traced back to specific components. Antonovsky recommended not to analyze subscales (Antonovsky 1993), yet the heterogeneity of SOC has fueled some discussion on their relative importance. We computed mean scores for comprehensibility (comp), manageability (man), and meaningfulness (mean). The step 4 incremental validity models presented earlier were then modified by replacing the mean global SOC score with the three mean scores for SOC subscales. Multicollinearity was not a problem with all VIFs < 3.02. For the prediction of psychological distress, SOC subscales contributed unique variance almost equally (β_{comp} = -.23, β_{man} = -.21, β_{mean} = -.16). For satisfaction with life (β_{comp} = -.01, β_{man} = -.13, β_{mean} = .31), emotional exhaustion (β_{comp} = -.04, β_{man} = -.07, bmean = -.18), cynicism (β_{comp} = .05, β_{man} = -.13, β_{mean} = -.44), and personal accomplishment (β_{comp} = -.01, β_{man} = .03, β_{mean} = .39), meaningfulness appeared to be the component with the strongest unique influence.

We also conducted split-group analyses to examine if the pattern of results from the incremental validity analyses was noticeably different for men versus women and for meditators versus non-meditators. Results for meditation subgroups (cf. Table 4) are especially important as meditators and non-meditators differed substantially on a number of variables. Results indicated only minor differences with regard to mindfulness, and SOC was a similarly strong predictor of all criteria in all groups. Mindfulness predicted life satisfaction for non-meditators, but not meditators. Additionally, emotional exhaustion could not be predicted by mindfulness any longer when groups were analyzed separately.

Thus, the incremental validity of SOC over mindfulness held in all subgroups. Even though mindfulness has always shown incremental validity over the Big Five traits, SOC had a clear-cut advantage when predicting all criteria in the last step of the analyses.

4 Discussion

Sense of coherence (SOC) and mindfulness are commonly seen as conceptually distinct constructs, both benefitting health. Nonetheless, there is a striking empirical relationship between the two as well as some conceptual overlap. Past research has shown highly similar correlations with neuroticism and health criteria. Yet despite mindfulness and SOC showing nearly identical correlations with neuroticism, SOC clearly outperformed mindfulness in terms of predictive validity in our study.

We examined incremental validity of SOC and mindfulness beyond Big Five personality traits. As previously observed, mindfulness and SOC both correlated substantially with the Big Five traits, most strongly with neuroticism, irrespective of which interpretive guidelines one prefers to interpret the size of this strong correlation (Cohen 1992; Gignac

Table 4 Regression analyses for the prediction of study criteria separately for meditators and non-meditators

	Psychological Distress (SCL-K-9)		Life Satisfaction (SWLS)		MBI emotional exhaustion		MBI cynicism		MBI pers. accomplishment	
	Meditators	Non-meditators	Meditators	Non-meditators	Meditators	Non-meditators	Meditators	Non-meditators	Meditators	Non-meditators
Age	-.10**	-.08*	.02	-.20***	-.10*	-.03	-.07	-.04	.13**	.08*
Sex	.01	-.01	.01	-.06	-.02	-.08*	.07	.02	-.05	-.07*
Education	-.06	-.06	.13***	.03	.06	.08*	-.03	-.02	.01	.09**
Neuroticism (N)	.27***	.18***	-.10***	-.02	.29***	.29***	.08	.00	.01	.05
Extraversion (E)	.01	.02	.09*	.09**	-.08	-.06	-.13**	-.08*	.13**	.08*
Openness (O)	.03	.03	.09*	.02	.03	.00	-.04	-.06	.11*	.09*
Conscientiousness (C)	-.01	-.03	.02	.03	-.06	-.04	-.08	-.02	.19***	.19***
Agreeableness (A)	.02	.02	.01	.07*	-.04	.03	-.07	-.11**	.06	.08**
Mindfulness (CHIME)	-.04	-.04	.01	.10*	-.06	-.09	-.03	-.07	.13*	.15**
Sense of coherence (SOC)	-.50***	-.54***	.58***	.55***	-.23***	-.24***	-.38***	-.41***	.30***	.28***
F	43.44	79.79	38.57	48.48	20.98	31.46	22.14	29.59	29.22	41.04
df	10,379	10,632	10,379	10,632	10,379	10,632	10,379	10,632	10,379	10,632
R^2	.52	.55	.50	.43	.36	.33	.37	.32	.44	.39

Beta weights are significant at * $p < .05$; ** $p < .01$; *** $p < .001$. Results represent the final steps of the multiple regression analyses depicted in Table 3

and Szodorai 2016). We initially examined incremental validity of mindfulness over the Big Five traits. Indeed, mindfulness explained additional variance beyond basic personality traits when predicting psychological distress, life satisfaction, and burnout. This supports mindfulness as a valuable construct for psychological health and wellbeing. We also replicated previous findings showing that SOC captures variance beyond the Big Five traits (Grevenstein and Bluemke 2015a; Hochwälder 2012). The new evidence shows that SOC still has incremental validity, not only beyond the Big Five traits, but also beyond Big Five in combination with mindfulness.

SOC captured most of the criterion validity of mindfulness. Especially psychological distress, life satisfaction, and cynicism could be predicted by SOC very effectively. Emotional exhaustion stood out as the only criterion where SOC was not the strongest predictor. Here, neuroticism was found to be the most influential personality trait. Rather than SOC being a particularly weak predictor, we reason that neuroticism was particularly well suited to predict emotional exhaustion due to its known emotional core related to negative affectivity (Bowen et al. 2012; Ormel et al. 2013), and its documented association with perceived stress (Otonari et al. 2012), which is already evident at the level of the zero-order correlation between neuroticism and the emotional exhaustion subscale of the MBI (Table 2). The MBI subscale personal accomplishment depended on a number of different factors. Even though SOC was still the strongest predictor, conscientiousness and—to a smaller degree—mindfulness could predict personal accomplishment.

Taking all these results into account, we conclude that SOC performs so well because it is a more inclusive construct than mindfulness. Mindfulness means confronting one's own emotions and cognitions, the environment, and difficulties with acceptance and without judgment. This should then enable a person to effectively deal with her own emotions and problems, rather than avoid them (Brown and Ryan 2003). SOC also includes aspects of coping with stress and emotions, visible, say, in the item "Does it happen that you have feelings inside you would rather not feel?" (Amirkhan and Greaves 2003; Eriksson and Lindström 2006). However, SOC is more inclusive than mindfulness by uniquely conveying purpose and meaning in life, providing a personal mental resource for understanding why handling stress effectively is worthwhile at all. Antonovsky (1987) hypothesized that SOC's meaningfulness component was the driving force and motivation for all coping activity. This is in line with research showing that having a feeling of purpose in life can help people overcome mental health issues (Kashdan and McKnight 2013). Piedmont and colleagues found that SOC's predictive validity for various outcomes including life satisfaction, wellbeing, and affect was attenuated after accounting for meaning in life (Piedmont et al. 2014). The first item of the SOC-13 scale, which is also part of the meaningfulness factor, reads "Do you have the feeling that you don't really care about what goes on around you?". This could be seen as the opposite of mindfulness, as a mindful individual should aim not to be distracted by external influences. Contrasting SOC, mindfulness is often understood in terms of attention and awareness, which have only shown minor associations with having purpose in life (Allan et al. 2015).

Aspects that go beyond attention and awareness, such as social and existential dimensions, are often lacking in Western conceptions of mindfulness (Nilsson 2014). In the Buddhist tradition mindfulness goes beyond attention or awareness to the present moment, but inherently includes contextual and ethical aspects. "Right" mindfulness should be a means to alleviate suffering, not just a goal in and of itself. In the Eastern tradition, mindfulness just cannot be "nonjudgmental"; it is inherently evaluative as it is grounded in an ethical framework (Dreyfus 2011).

Practicing mindfulness meditation should ultimately lead to a higher degree of acceptance of inner and outer circumstances. This should theoretically help a practicing meditator to find meaning in life. Our participants who regularly practiced meditation were healthier and happier, supporting potential positive effects of meditation if causality can be assumed. It seems, however, that (physical and mental) mindfulness in itself is not the most critical aspect in the long run. Jeserich (2013) reasoned in a review that SOC could be increased by mindfulness-based interventions. We conclude that the process by which mindfulness meditation can improve health is more complex than is commonly acknowledged (Van Dam et al. 2014). In the current literature the view of mindfulness mostly follows Kabat-Zinn's (1994) interpretation with a strong focus on attention and awareness. Thus, our research and our data also support a theoretical objection raised recently by scholars. Mindfulness as understood in the Western community is essentially stripped of meaning (Hanley et al. 2016). In the Eastern tradition, mindfulness has the aim to alleviate suffering and is therefore not ethically neutral, but rather ethically valenced. SOC might capture an important aspect of practicing mindfulness that is still neglected in current mindfulness scales. SOC was similarly important in meditators as it was in non-meditators. This is remarkable given that both groups differed on several variables. We propose that SOC reflects fundamental aspects of personality that promote health. Our own research has shown that SOC not only possesses incremental validity beyond resilience, optimism, and self-compassion, but captures all of the criterion validity of its competitors when predicting psychological distress (Grevenstein et al. 2016a). The necessity to expand the focus of health from a treatment of disease to promotion of health has been recognized for some time. Yet it may be the comprehensive, existential appeal of SOC of going beyond personal skills that fuels its effectiveness.

4.1 Limitations, Future Research, and Recommendations

Our sample is not a probability-based sample, representative of the general population, but constitutes at least in part a self-selected sample. In previous studies on mindfulness, differences between meditators and non-meditators emerged (Belzer et al. 2013; Van Dam et al. 2009). Therefore, we specifically targeted a meditation-inclined subpopulation. Yet, our sample is not at all homogenous. Therefore, we compared our participants to previous samples with regard to their ratings on the Big Five personality measure. Even though differences on mean scores were apparent, variances were comparable even to a large representative sample (Hahn et al. 2012; Specht et al. 2014). With regard to the crucial variable mindfulness, our sample almost perfectly mirrors the data previously reported by Bergomi et al. (2014). At last, a study by Schumacher et al. (2000b) measured SOC in a representative sample. Again, their data closely match our own data. Our sampling has maximized the variance of mindfulness, so the surprisingly low criterion validity of mindfulness cannot be attributed to a low number of actual practitioners, yet may have introduced problems for the generalizability of our results.

Outcomes in our study could only include a subset of potentially relevant aspects of quality of life. Most noteworthy, we used only a short scale to measure psychological distress. Clinical samples and proper measures of clinical symptoms should be investigated in the future. We note here that future studies on mindfulness interventions should also consider controlling pretest SOC scores (as a potential confounder) when estimating intervention effects, alternatively using posttest SOC scores as a potential outcome variable for mindfulness-based interventions. Quite generally, when clinicians are faced with the question whether to use mindfulness or SOC as a predictor of future patient health, we

would currently recommend using SOC. Though not denying the utility of mindfulness as a construct, we think SOC might help clinicians to make better inferences about patients' generalized resistance resources, resilience, and health-beneficial traits.

Cross-sectional data do not allow examining causal relations. We cannot strictly support positive effects of meditation. Some of the constructs examined here are known-stable personality characteristics, whereas other constructs, such as mindfulness, might be more dynamic. However, we used a measure that considers mindfulness as a trait rather than as a state. Meditators in our sample scored most dominantly higher on mindfulness, supporting the validity of our data. Additionally, one should be careful not to consider personality as absolutely stable and fixed, since even basic personality can dynamically change across the life course (Harris et al. 2016; Specht et al. 2011). Representative samples and longitudinal studies will be needed to examine potential long-term effects of meditation on an individual's personality.

5 Conclusion

Mindfulness showed incremental validity over the Big Five traits, and likewise did SOC. Still, SOC explained substantial variance in the criteria beyond mindfulness, rendering SOC incrementally valid over and beyond mindfulness for predicting health-related criteria. We reason that meaningfulness is the unique component of SOC. Even though we have used a comprehensive mindfulness measure (CHIME), future conceptions of mindfulness may reach out to include Eastern assumptions. Specifically social and existential components may be needed to make mindfulness a more inclusive construct that can account for more criterion variance when predicting health and evaluating the effects of mindfulness/meditation interventions on important health outcomes.

Acknowledgements Thanks go to Kirstin Giese and Sarah Barthelmann for help with the data collection and to Dirk Hagemann for valuable discussion.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Standard All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study. The study was approved by the ethics committee of the university hospital Heidelberg (S-114/2015).

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