



Enabling a Socio-cognitive Perspective of Mindfulness: The Development and Validation of the Langer Mindfulness Scale

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Abstract

This article outlines the development of a 14-item measure of socio-cognitive mindfulness. Using eight samples (including multisource and multi-wave data) with a total of 4139 responses the authors developed a reliable scale with a tri-dimensional factor structure that replicated across five separate samples. The scale possessed both convergent and discriminant validity, and criterion-related validity was demonstrated through the scale's relation with development-related categories of psychological well-being, such as life satisfaction and humor, dimensions of physical well-being, e.g., strength, flexibility, and reaction time, as well as aspects of social and organizational well-being including job satisfaction, creativity. Overall, the present study suggests that the Langer Mindfulness Scale (LMS14) is a reliable and valid measure and that the LMS has important implications for individual development within social contexts.

Keywords Mindfulness · Socio-cognitive · Measurement · Adult development · Validation · Well-being

Introduction

Mindfulness has long been considered a widely relevant social psychological concept, with many relational implications related to adult development (Albert 1990). Mindfulness, understood as a cognitive style (Sternberg 2000), is argued to positively affect various outcomes of adult development such as creativity, physical well-being, and psychological well-being (Brown and Ryan 2003; Langer 2005, 2009). One problem in the study of mindfulness has been the lack of conceptual clarity, with Eastern and Western traditions emphasizing different aspects (Yeganeh 2006). Another problem has been the lack of empirical measures for Western-based mindfulness concepts. Whereas some measures have been developed (Baer et al. 2008; Brown and

Ryan 2003) they usually follow the Eastern tradition, where meditation, presence in the moment, and state-level awareness are central. The current study is designed to provide an alternative measure, based on a Western, socio-cognitive perspective of mindfulness in the tradition of Ellen Langer.

This paper extends existing research in several ways. First, it elaborates the definition of socio-cognitive mindfulness. Second, it provides a Western perspective of traditionally Eastern, meditative concepts that have so far mostly been applied in clinical settings. Thirdly, it presents a valid and reliable scale that advances research on mindfulness in clinical, interpersonal, social, and organizational contexts. Fourthly, it contributes to a more refined understanding of cognitive processes within the perspectives of psychological, physical, and social well-being, highly applicable to adult development. Understanding cognitive processes leading to well-being is applicable for adult development not only for clinical assessments, practical interventions, but to further provide theoretical and conceptual approaches to develop clearer insights how mind and body interrelate throughout the stages of human development (Demick and Andreoletti 2012; Knox 1977).

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Mindfulness as Concept

The literature on mindfulness consists of two distinct, yet related concepts. One is derived from contemplative, cultural, and philosophical traditions such as Buddhism, and involves the cultivation of a moment-to-moment, non-judgmental awareness of one's present experience (Brown and Ryan 2003; Kabat-Zinn 1994). This concept of mindfulness is practiced mainly through formal and informal meditation (e.g., Yeganeh 2006). The second mindfulness concept is derived from Western scientific literature, and is defined as cognitive flexibility which allows individuals to actively construct novel categories and distinctions (Langer 1989). This socio-cognitive approach to mindfulness differs from the meditative approach because it usually includes the external, material, and social context of individual participants (Baer 2003; Langer 1989). It pursues a learning agenda, can be very goal-oriented, and involves the use of mindfulness in enhancing problem solving and other cognitive exercises (Baer 2003; Baer et al. 2008; Langer 1989; Yeganeh 2006).

Western, social-cognitive mindfulness thus is understood as an active mindset characterized by novel distinction-drawing that results in being (1) situated in the present, (2) sensitive to context and perspective, and (3) guided (but not governed) by rules and routines (Langer and Moldoveanu 2000). Langer argues that mindfulness is manifested in cognitive flexibility that enhances the degree to which an individual is seeking new perspectives (novelty seeking), the degree to which an individual is engaging in creative activity (novelty producing), and the degree to which an individual is able to engage with the current situation and/or moment (engagement) (Bodner 2000; Bodner and Langer 2001). Mindlessness, by contrast, is defined as a mindset of rigidity in which one adheres to a single perspective of distinctions/categories drawn in the past and acts automatically, oblivious to context or perspective (Langer 2005, 2009, 1989, 1997).

The concepts of mindfulness and contrasting counterpart of mindlessness were introduced to social psychology four decades ago. Of particular interest to scholars and practitioners of Eastern and Western tradition is how people can develop higher levels of mindfulness. Clinical psychology has made significant advances in conceptualizing and measuring mindfulness as a meditative concept focusing on attention, awareness, and absence of judgment. Kabat-Zinn et al. (e.g., 1992) have developed mindfulness-based interventions that are designed to increase mindfulness in the span of several weeks through intensive meditative trainings. The majority of mindfulness assessments are similarly drawing from an Eastern perspective on mindfulness (e.g., MAAS, Brown and Ryan

2003). Research related to mindfulness in social settings, i.e., organizational contexts, in contrast, refers to a decidedly Western notion of mindfulness, a socio-cognitive approach. Weick and Sutcliffe (2006) suggest that in that literature the "prevailing way to conceptualize mindfulness has been to borrow from Ellen Langer's (e.g., 1989) ideas" that center on cognitive aspects of mindfulness including novelty seeking, novelty producing, and engagement. Similarly, Demick (2000) suggests that personal development within social contexts maybe studied effectively through the lens of Langer's conceptualization.

Whereas the Langerian notion of mindfulness has been the backbone of mindfulness research in relational contexts, there has not been a reliable and valid measure of mindfulness in this tradition. Such a scale would not only allow further empirical exploration of mindfulness in social, group, or organizational contexts but possibly enhance the study of adult development (Alexander and Langer 1990; Demick 2000; Demick and Andreoletti 2012) or collective mindfulness (Weick et al. 1999). Furthermore, such a scale could also add a novel perspective to clinical psychology (Ludwig and Kabat-Zinn 2008) and complement existing Eastern-based scales in personal and social psychology (Brown and Ryan 2003; Schmertz et al. 2009). Therefore, to remedy this shortcoming, this paper seeks to develop and validate a scale that allows mindfulness assessments based on the Western, Langerian, socio-cognitive approach to mindfulness.

Mindfulness Measurement

Growing interest in mindfulness as a way to enhance psychological and physiological treatment has led to several attempts to operationalize and measure mindfulness for (almost exclusively) clinical use based on an Eastern, Buddhist perspective. Existing measures include the Mindfulness Attention and Awareness Scale (MAAS, Brown and Ryan 2003), the Five Facet Mindfulness Questionnaire (FFMQ, Baer et al. 2008), the Freiburg Mindfulness Inventory (FMI, Walach et al. 2006), the Kentucky Inventory of Mindfulness Skills (KIMS, Baer et al. 2004), the Toronto Mindfulness Scale (TMS, Lau et al. 2006), or the Cognitive and Affective Mindfulness Scale-Revised (CAMS, Feldman et al. 2007).

As these measures share a similar Eastern heritage, there is a significant overlap. Still each measure hones in on unique aspects of mindfulness and thus the conceptualizations are distinct. The MAAS, a uni-dimensional scale, was developed to measure attention and awareness to present moment experiences. Likewise, the CAMS and FMI are also single-factor scales; however, they aim to capture other dimensions of mindfulness such as acceptance/non-judgment, openness to negative experiences, and letting go.

Further scales have been developed to measure dimensions of mindfulness as separate factors. The TMS was designed to reflect a two-component model of mindfulness (Bishop et al. 2004) and is composed of two factors: curiosity and decentering. The four-factor KIMS measures mindfulness along the dimensions of Observing, Describing, Acting with Awareness, and Accepting without Judgment (Baer et al. 2004; Linehan 1993). The five-factor FFMQ (Non-reactivity, Observing, Acting with Awareness, Describing, and Non-judging) was derived from 112 pooled items from existing scales including the MAAS, FMI, KIMS, and CAMS.

As these scales have been designed mainly for clinical use, they are less conducive to action-oriented social settings such as personal development with social relationships or within organizational contexts. Langer's socio-cognitive approach encompassing the notions of novelty seeking, novelty producing, and engagement allows not only for more consistent usage of mindfulness theory within adult development in social contexts, but it can also help shed light on mindfulness theory in clinical settings.

Development of a Socio-cognitive Mindfulness Scale (LMS)

To create a reliable and valid measure in the Western, Langerian tradition of socio-cognitive mindfulness, we followed the steps outlined in the survey measure development literature (Dobrow and Tosti 2011; Ferris et al. 2008; Hinkin 1998). In the following, we present the results of our ongoing research in four phases. Phase 1 details the initial generation of a pool of potential scale items and the refinement of the items into a 21-item scale. Phase 2 details the psychometric properties (reliability estimates, factor structure, dimensionality, and stability) and the reduction to a 14-item scale. Phase 3 details the convergent and discriminant validity of the 14-item scale, and Phase 4 examines the scale's criterion-related validity. We replicated and cross-validated the findings reported in Phases 2 through 4 by using samples drawn from 8 separate studies.

Phase 1: Item Generation and Reduction

Over the past 25 years, tenants of Langer's theory of mindfulness have been examined by employing novel research approaches designed to elicit mindful processing (Alexander and Langer 1990; Anglin et al. 2008; Langer et al. 2010; Langer and Abelson 1983; Langer and Dweck 1973). Developed from an information processing perspective, socio-cognitive mindfulness is exhibited by cognitive flexibility that manifests in (a) novelty seeking behaviors such as curiosity and openness, (b) novelty producing behaviors such as creativity and perspective taking, as well as (c)

engagement with current activities, people, and contexts. We consulted existing literature and interviewed experts on mindfulness and the related sub-constructs of novelty seeking, novelty producing, and engagement and developed a battery of items. Following Hinkin (1998), we generated items that were succinct and easily comprehensible of which 46 were tested based on their face validity (see also Bodner 2000). These items were then screened for redundancies and representativeness of Langer's mindfulness construct by two of the authors, and rated by other experts thus resulting in a set of 21 items (see "Appendix").

Phase 2: Psychometric Properties of Scale

The psychometric properties of the LMS were evaluated in terms of reliability, factor structure, and temporal stability. In this phase, we conducted psychometric analyses on 6 independent samples over time (see Table 1 for sample information). We collected a total of 3983 surveys involving 3453 participants. We conducted psychometric evaluations using the 21-item survey in 4 independent samples. Each survey included additional measures for convergent, discriminant, and criterion-related validity purposes. See Table 2 for a complete overview of measures collected in each sample.

Method

To test the 21-item scale, we tested its reliability, factor structure, and stability. To do so, we ran a series of large sample studies to refine the factor structure and overall ensure adequate psychometric properties. We thus report six large sample studies with a total of 3453 respondents that we based our refined scale structure on. This process ultimately led to a reduction of 7 more items that proved redundant, unreliable, or unstable.

Participants and Procedure We conducted psychometric analyses on data from 3453 individuals across six different and independent samples. We collected a total of 3983 surveys. Each included the mindfulness items as well as demographic questions and other measures for convergent, discriminant, and criterion-related validity purposes. See Table 1 for Sample overview, Table 2 for overview of measures collected in each sample, and Table 3 for descriptive statistics.

Measures Unless otherwise noted, all ratings were made with a 7-point Likert scale (1=strongly disagree and 7=strongly agree). We measured socio-cognitive mindfulness with the 21-item version of the scale developed in Phase 1 (see "Appendix"). In each sample we evaluated a number of other constructs for validation purposes that we will refer to in Phase 3 (see Tables 2, 5, 8). For Samples 5 and 6 that were gathered to help assess temporal and inter-

Table 1 Overview of sample characteristics

Characteristic	Sample							
	1	2	3	4	5	6	7	8
Location	Western U.S.	Entire U.S. and other English-speaking countries	Entire U.S.	Across English-speaking countries (including Australia, UK, South Africa, Canada, U.S.)	Israel	Israel	Eastern U.S.	North Eastern U.S.
N	351	314	256	2273	108	152	52	104
Type	Students, staff, faculty	Professionals	Professionals	Professionals	Pregnant mothers	Students	Nursing home residents	Students/professionals
Age range (years)	17–65	19–73	16–74	17–93	22–43	20–36	57–100	18–25
Age mean (years)	34	43.7	41.6	45	28.7	23	77.9	21.5
Female (%)	72	60	65	98	100	77	66	45
Caucasian (%)	73	65	80	79	100	99	85	65
Asian (%)	14	14	4	4	0	0	8	23
Other ethnicity (%)	13	21	16	17	0	1	7	12

cultural stability, the samples were surveyed twice 1 year apart (Sample 6, students), and 4 times (Sample 5, pregnant women) with time 1 week 25–30 of pregnancy; time 2–3 weeks later; time 3–2.5 weeks before the due date; time 4–1 month after birth.

Results

We found that our proposed three-factor structure fit the data well. To achieve a better fit though, we had to reduce the number of items from 21 to 14. The dimensionality according to our factor analysis results then was very strong. We also found that the reliability of the constructs was high and the temporal and cultural stability was robust.

Dimensionality We first examined the dimensionality of the LMS by performing an exploratory factor analysis (EFA) using principal axis factoring and Promax rotation (Russel 2002). We examined the number of factors extracted with Eigenvalues greater than or equal to 1, which indicated 4–5 factors across all samples with all 21 items. We examined the factor structures proposed and found several items that did either load on several factors with loadings of > 0.4 or less than 0.4 on any one of the factors. Following Hinkin (1998) and Nunnally and Bernstein (1994), we removed such items and ended up deleting 4 items. We repeated this analysis for all samples and continued with stepwise elimination of four items. We reran the exploratory factor analysis with another

subset and found 3 factors with Eigenvalues greater than or equal to 1 across all samples with the remaining 17 items. These results were confirmed by an additional scree plot analysis. The average variance explained by these three factors ranged from 55 to 58%.

We next performed a confirmatory factor analysis (CFA) using the AMOS software program (Arbuckle 2012). Analyzing the different samples, we found that three items were loading across the other factors and were unreliable (item 16, 3, and 11). We thus reduced the scale items to 14 and found strong support for the three-factor model based on 14 items. Excellent fit is evidenced by $CFI > 0.9$ or higher and a RMSEA of 0.08 or lower (Chou and Bentler 1995) and across the samples we find a CFI ranging from 0.92 to 0.95 and an RMSEA of 0.052 to 0.063. Any four-factor model and the one factor model were consistently worse fitting than the theoretically derived three-factor model (see Table 4).

Reliability To assess reliability, we examined the coefficient alphas and average corrected item-total correlations of the 14 items. Because scale items must vary in order to co-vary, we assessed the means and standard deviations of the items as well (DeVellis 2003). The coefficient alphas reliability estimates of the entire scale ranged from 0.83 to 0.9 across samples 1–6 and remained stable over subsequent time periods in Samples 5 and 6. These reliability estimates are considered “very good” for this number of items (DeVellis 2003).

Table 2 Overview of measures used in each sample

Measure (source)	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8
MAAS (Brown and Ryan 2003)	x	x	x	x			
NCS (Cacioppo et al. 1984)		x	x				
PA (Watson et al. 1988)		x	x				
Humor		x	x				
PNS (Thompson et al. 1989)		x	x				
NA (Watson et al. 1988)		x	x				
Need for vacation		x	x				
FFMQ (Baer et al. 2008)					x		
Openness (Costa and McCrae 1992)					x		
Neuroticism (Costa and McCrae 1992)					x		
Purpose in life (Ryff and Keyes 1995)		x	x				
Personal Growth (Ryff and Keyes 1995)		x	x				
Mental health (MHI, Veit and Ware 1983)				x	x		
Self-esteem (RSE/SISE, Rosenberg 1979)				x	x		
Subjective Happiness (Lyubomirsky and Lepper 1999)		x	x ^a				
Life Satisfaction (SWLS, Diener et al. 1985)		x	x	x	x		
Negative emotional states (DASS, Lovibond and Lovibond 1995)				x			
Self-reported health				x			
3rd-party assessed health						x	
Reaction time			x ^a				
Perceptions of aging			x				
Pain during labor					x		
APGAR					x		
Positive relations with others (Ryff and Keyes 1995)		x	x				
Social well-being (ECR, Brennan et al. 1998)				x			
Job satisfaction		x	x				
Employee engagement (Harter et al. 2002)		x					
Creativity		x					
Decision-making (Chow 2012)							x

MAAS Mindful Attention and Awareness Scale, NCS need for cognition, PA positive affect, PNS personal need for structure, NA negative affect, FFMQ Five Facets of Mindfulness Questionnaire

^aThese measures were evaluated only for a subset of 624 participants

The sub-constructs reliability scores range from 0.75 to 0.86 across the samples for the Novelty Seeking Factor, and 0.71 to 0.9 across samples for Novelty Producing, and from 0.65 to 0.8 across the samples for the Engagement Factor, all deemed acceptable.

Stability Cross-cultural stability was tested with Sample 5 and 6 in which the LMS was translated and back translated and showed very solid reliability and dimensionality scores (see Table 5). We assessed temporal stability in the short term using Sample 6 (a duration of 3 weeks between time 1 and time 2, a duration of 9.5 weeks between time 2 and time 3, and a duration of 6.5 weeks between time 3 and time 4). We assessed the temporal stability in the long term using Sample 5 (time 1 to time 2, 1 year) and using Sample 6 (time 1 to time 4, 19 weeks). Examining the cor-

relations between time 1 mindfulness and time 2, we find significant short-term and long-term correlations ranging from .665 to .821 ($p < .001$) for the entire scale. We find very high inter-temporal correlations for the sub-constructs of Novelty Producing (.76–.84) and Novelty Seeking (.71–.80) and Engagement (between .5 and .64) even though at time 4 Engagement scores were only correlating with .38. Thus the LMS showed evidence of stability in both the short and long term, even across important life events such as first pregnancies.

Phase 3: Convergent and Discriminant Validity of Scale

For the purpose of establishing convergent validity, we examined the relationship between socio-cognitive

Table 3 Descriptive statistics for Samples 3, 4, 5, and 6

	Sample 3			Sample 4			Sample 5			Sample 6		
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N
LMS 14	5.09	0.73	256	3.91	0.48	2258	5.23	0.8	87	5.47	0.76	131
LMS 14_NS	5.39	0.88	256	4.11	0.54	2258	5.34	0.89	87	5.59	0.98	131
LMS 14_NP	4.76	0.85	256	3.64	0.66	2258	4.93	1	87	4.98	1.09	131
LMS 14_E	5.11	1.08	256	4.02	0.57	2258	5.76	1.01	87	5.92	0.99	131
MAAS	3.51	0.98	256	3.42	0.62	2258						
NCS	4.75	0.85	256	3.62	0.54	2258						
PA	5.23	1.05	256	3.94	0.6	2258						
Humor	4.73	1.47	256	3.57	0.91	2258						
PNS	4.15	0.83	256	2.96	0.58	2258						
NA	3.63	1.31	256	2.58	0.83	2258						
Need for vacation	4.18	1.67	256	3.01	1.08	2258						
Age	41.65	16.29	256	53.76	11.34	1989	28.71	3.73	108	23.24	2.37	131
FFMQ							3.24	1.04	59			
Openness							3.84	0.6	132	3.84	0.6	132
Neuroticism							2.95	0.73	132	2.95	0.73	132
Psychological well-being												
Purpose in life (Ryff)	4.93	0.94	256	3.79	0.54	2208						
Personal growth (Ryff)	6.02	1.08	256	4.26	0.51	2249						
(MHI) Psychological WB							3.2	0.84	97			
(MHI) Psych. distress							4.87	0.85	87			
Self-esteem (RSE/SISE)							3.46	0.45	87			
Subjective well-being	4.89	1.31	256	4.61	0.88	632						
Life satisfaction	4.05	1.5	256	3.35	0.87	2203	5.53	1.05	87			
Negative emotional states (DASS) depression										3.66	0.42	131
Negative emotional states (DASS) anxiety										3.75	0.32	131
Negative emotional states (DASS) stress										3.23	0.61	131
Physical well-being												
Self-reported health										6.15	0.97	131
Reaction time				0.42	0.443	596						
Perceptions of aging				3.93	0.63	2258						
APGAR							8.88	0.61	89			
Social/organizational well-being												
Positive relations with others (Ryff)	4.86	1.09	256	3.82	0.69	2308						
Attachment anxiety (ECR)							2.83	1	77	3.21	1.09	132
Attachment avoidance (ECR)							2.34	0.95	77	2.86	0.94	132
Job satisfaction	4.72	1.42	256	3.71	0.88	2253						
Employee engagement (Gallup)				8.36	2.92	632						
Creativity	3.91	1.49	256									

mindfulness and conceptually similar constructs, for which we expect positive correlations. For the purpose of establishing discriminant validity, we then examined the relationships between socio-cognitive mindfulness and conceptually dissimilar constructs, for which we expect low or negative correlations (Campbell and Fiske 1959; Ferris et al. 2008; Hinkin 1998).

The convergent validity analyses focused on the relationship between the LMS and other recent measures of

meditative mindfulness. We included the most frequently used scale based on a meditative understanding of mindfulness, MAAS, as well as the FFMQ which represents a broader and a more integrative mindfulness scale that should also measure socio-cognitive mindfulness. First, MAAS (Brown and Ryan 2003) was developed to measure the presence or absence of attention and awareness in a specific moment. It is thus more concerned with diagnostic ability and less with cognitive flexibility, productive, or synthetic

Table 4 Internal validity–dimensionality

	Sample 1	Sample 2	Sample 3	Sample 4
CFA (3 factor model)				
χ^2	142	171	241	536.1
DF	72	72	72	72
CFI	0.943	0.92	0.943	0.95
RMSEA	0.053	0.063	0.059	0.052
CFA (1-factor model)				
χ^2	320.8	384.4	659.3	1618
DF	76	76	77	76
CFI	0.796	0.748	0.688	0.831
RMSEA	0.096	0.109	0.129	0.093

Based on LMS14 using 14 items

capabilities of an individual. It is also more directed towards the present state of consciousness rather than the assessment of overall mindfulness potential awareness of context or mindfulness capability. Still we expect a moderate positive correlation with our socio-cognitive scale because attention and awareness are constitutive elements of the engagement sub-factor of mindfulness. We also expect MAAS and LMS to be differentiable.

Second, we examined the relationship between the LMS and the FFMQ (Baer et al. 2008). The FFMQ still heavily draws on Eastern perspectives of mindfulness using items from existing scales such as MAAS, KIMS, and SMQ. We included this measure as it seems the most representative of other mindfulness measures by including facets of Non-reactivity, Observing, Acting with Awareness, Describing, and Non-Judging. We similarly expect a moderate, positive correlation with our LMS because factors of observing and describing are constitutive elements of the socio-cognitive mindfulness. Still, we expect FFMQ and LMS to be differentiable and have unique, unshared variance.

We included additional constructs in our convergent validity analysis, such as the need for cognition, and personality constructs such as openness to experience as they conceptually share common elements with the LMS.

First, we examined the relationship of our notion of mindfulness scale with what Cacioppo et al. (1984) label the need for cognition. The need for cognition scale (NCS) measures individual differences in enjoyment of effortful cognitive endeavors. Those individuals with a high interest in thinking and understanding complex problems as well as other intellectual tasks are considered in high need of cognition (Cacioppo et al. 1984). As our mindfulness scale stresses the cognitive aspects of mindfulness, we expect high scorers of the need for cognition to also score higher on our mindfulness scale, especially the novelty seeking sub-construct. Therefore we expect a moderate, positive correlation of the LMS and the NCS. We also expect sufficient difference of

Table 5 Internal validity:reliability

LMS 14	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5 (t1)	Sample 5 (t2)	Sample 5 (t3)	Sample 5 (t4)	Sample 6 (t1)	Sample 6 (t2)
Full Scale	0.83	0.82	0.83	0.85	0.89	0.85	0.9	0.89	0.85	0.87
NS	0.75	0.76	0.79	0.77	0.81	0.83	0.86	0.84	0.83	0.84
NP	0.79	0.79	0.71	0.75	0.87	0.86	0.89	0.9	0.85	0.81
E	0.65	0.66	0.72	0.65	0.73	0.7	0.8	0.8	0.8	0.72

Measures are Cronbach's alphas; based on 3-factor structure/14 items

the two concepts because the creative, synthesis-related elements of novelty production as well as the engagement with social context may be less reflected by the need for cognition.

Second, we examined the relationship between our mindfulness scale and the existing personality traits. As the LMS is measuring a more general mindfulness capability it is not measuring a state (as the MAAS is). Therefore, we could expect that personality traits will influence levels of mindfulness. Especially the personality trait openness to experience should correlate with the novelty seeking construct of the LMS. The personality trait openness to experience, as described in the Big Five Factor Model, measures the openness to ideas, values, aesthetics, emotions, fantasy, and actions (Costa and McCrae 1992). High scorers report receptivity to novel experiences and actions and a high frequency of, and interest in, imaginative and reflective thought. Therefore, while distinct, individual scores on openness to experience should also correlate with scores on mindfulness. Nevertheless, mindfulness is conceptually broader than openness to experience which only indirectly reflects the aspects of cognitive flexibility related to problem solving, creativity, and engagement with context.

Third, we examined the relationship between our socio-cognitive mindfulness scale and positive affect (Watson et al. 1988). Mindfulness as cognitive flexibility allows reappraising a multitude of situations and experiences to the degree that, e.g., negative experiences can be viewed more positively. In general, mindfulness has been shown to influence emotional responses to daily occurrences. Especially Eastern-based mindfulness research has found that mindfulness has a positive impact on how individuals process emotional reactions finding that higher levels are leading to higher positive affect (Brown and Ryan 2003). We suggest that our socio-cognitive mindfulness measure will also capture such effects on positive affect.

Fourth, we identified the relationship between our mindfulness measure and humor. Humor is widely regarded to stem from the ability to surprise and confront the listener with something unexpected (Veatch 2009). Mindfulness as cognitive flexibility should allow mindful people to present others with unexpected, surprising perspectives of the world more often than mindless people stuck in rigid categories. Humor breaks categories and allows people to see novel and unexpected connections (Veatch 2009). The level to which individuals possess humor and are considered humorous themselves is largely seen to be a factor of the ability to think in novel categories. Mindfulness in our definition is the ability to draw novel distinctions and the ability to see novelty and produce novelty can be expressed through humor (Carson and Langer 2006; Langer 1989; Veatch 2009). As such we expect a moderate correlation between our mindfulness measure and humor.

Our discriminant analyses first focused on the relationship between the LMS and the need for structure. Thompson et al. (1989) argue that individual differences in the desire for simple structure may influence how people understand, experience, and interact with their worlds (Neuberg and Newsom 1993). Such preferences for simplicity and reductionism can be viewed as a preference for routine interactions that require little cognitive processing capability. We argue that this personal need for structure should thus negatively correlate with our mindfulness measurement, which reflects the ability of individuals to engage with the complexity of daily life.

We also examined the relationship between personality traits and mindfulness. As argued above, mindfulness here is not just a state measure but also that of a learning style, which shares trait-like characteristics (Sternberg 2000). Stable personality traits such as neuroticism, introversion, or conscientiousness should therefore influence the individual level of mindfulness. We are especially interested in the relationship between the neuroticism trait and our mindfulness measure, because neuroticism describes an enduring tendency to experience negative emotional states. Mindfulness in contrast would allow individuals to entertain multiple perspectives and enable choice. Following Seligman et al. (2005) as well as Langer (2009) when individuals have the choice between a positive appraisal and a negative appraisal of a situation, they largely choose a positive perspective. As such we expect a highly negative relationship between neuroticism and our mindfulness measure.

We further examined the relationship between mindfulness and negative affect (Watson et al. 1988). Our mindfulness concept measures the level of engagement with the world as well as the willingness and ability to seek and produce novelty and it is suggested that such interactions are more likely to generate positive than negative affective states (Brown and Ryan 2003; Langer 2005, 2009). As a consequence, we predict our mindfulness measure to correlate negatively with negative affect measures.

Finally, we examined the relationship between our concept of mindfulness and the need for vacation. Rest and relaxation are often required when physical or mental exhaustion sets in. Mindfulness as cognitive flexibility is argued to generate positive affect and replenish energy which leads to less need for physical and mental relaxation (Langer 2009). As such we would expect to see a negative correlation of need for vacation with our mindfulness scale.

We do not expect variance in mindfulness based on demographic characteristics. Although mindfulness may increase over time within a specific individual, we expect mindfulness to be unrelated to age as between-individuals variable. We also expect mindfulness to be unrelated to gender.

Method

Participants and Procedure Participants were the same ones introduced in Phase 2 as Samples 3, 4, 5, and 6. Table 2 displays an overview of measures used in each sample.

Measures LMS 14: The LMS14 is the scale developed in Phase 2 above (see “Appendix”), measuring three components of socio-cognitive mindfulness. This measure has adequate internal consistency with alphas ranging from 0.8 to 0.9.

Mindful Attention and Awareness Scale: We used the scale developed by Brown and Ryan (2003) based on a conception of an Eastern understanding of mindfulness. The internal consistency of the scale ranged from 0.82 to 0.86.

Five Facet Mindfulness Questionnaire: We use the five facet of mindfulness questionnaire (FFMQ) as it was developed to measure mindfulness in an integrative manner (Baer et al. 2008). In our study, the internal consistency of the scale was low at 0.59.

Need for cognition: We used this 18-item scale (Cacioppo et al. 1984) which measures individual differences in engagement and enjoyment of “effortful cognitive endeavors.” High scorers endorse items reflecting interest in thinking, complex problem solving, and intellectual tasks. The internal consistency of the scale ranged from 0.79 to 0.84.

Personality traits: The big five personality traits of openness to experience as well as neuroticism were assessed with the Hebrew version of the 44-item Big Five Inventory (BFI; John et al. 1991). The internal consistencies of the openness to experience factor were 0.79 and that of neuroticism were 0.80.

Self-defined Humor Scale: We included one item on humor based on the fact that third parties viewed people as being humorous. The item was evaluated on a 7-point Likert scale (ranging from disagree strongly to agree strongly).

Positive affect: We used the Positive Affect dimension of the Positive and Negative Affect Scale (PANAS20; Watson et al. 1988) is a 20-item questionnaire that assesses two orthogonal dimensions of mood: positive and negative affect. This measure has adequate internal consistency with alphas of Positive Affect ranging from 0.9 to 0.91.

Personal need for structure: We measured the Individual differences in the desire for simple structure with the Personal Need for Structure Scale (PNS) developed by Thompson, Naccarato and Parker (Thompson, et al.) and confirmed in various follow-up studies (e.g., Neuberger and Newsom 1993). This measure has adequate internal consistency with alphas ranging from 0.8 to 0.83.

Negative affect: We used the Negative Affect dimension of the Positive and Negative Affect Scale (PANAS20; Watson et al. 1988) which is a 20-item questionnaire that assesses two orthogonal dimensions of mood: positive and

negative affect. This measure has adequate internal consistency with alphas of Negative Affect ranging from 0.89 to 0.9.

Self-defined Need for Vacation Scale: We created a one-item need for vacation measure. Using a 7-point Likert scale we asked respondents to indicate the extent to which they agree with the following statement: I really need a vacation.

Age: We used participants’ age in years as the measure of age.

Gender: Gender was coded as 1 = female and 0 = male.

Analytic Strategy Although we expected the LMS to correlate with the variables, we chose for our convergent and discriminant validity analyses, we wanted to establish that our measure was truly distinguishable from these constructs. Therefore, following Ferris et al. (2008) and Dobrow and Tosti (2011), we built our case for convergent and discriminant validity in two ways. First, we examined the zero-order correlations between the LMS and its sub-constructs (NP, NS, and E) in the four independent samples. We used samples 3, 4, 5, and 6 for that.

Second, we tested any significant correlations via confirmatory factor analysis to ensure the constructs were not converging to the point of being redundant (see also Dobrow and Tosti 2011) using the largest samples (Samples 3 and 4). The purpose of this test is to ensure that constructs are indeed separate despite high correlations between the tested constructs with the LMS and its sub-constructs. To conduct this test, we follow Ferris et al. (2008) and establish whether models in which the covariance between LMS and the convergent constructs are fixed to 1.0 fit better than a model in which the covariance is estimated. In case a combined factor model has better fit with the data, determined by the significantly lower Chi-square statistics, than the two constructs separately, they are redundant.

Results and Discussion

Tables 6 and 7 present the correlations between the socio-cognitive mindfulness and the other variables in Samples 3–5, respectively. Our mindfulness measure was significantly, yet moderately related to other mindfulness measures such as MAAS and FFMQ. Correlations for LMS and MAAS ranged from 0.265 to 0.355 for Samples 3 and 4 ($p < .01$). Sub-constructs were correlating with MAAS from 0.113/0.239 (NS), 0.158/0.269 (NP) to 0.357/0.377 (E) for Sample 3/Sample 4, respectively ($p < .001$). The correlation for LMS and FFMQ was 0.37 ($p < .01$). The sub-constructs of novelty producing and engagement were moderately significantly correlated with the FFMQ total score (NP: 0.33; $p < .05$; E 0.32; $p < .05$), whereas Novelty Producing also significantly correlated with the Describe Subscale of the FFMQ (0.29; $p < .05$) and the engagement subscale with

Table 6 Discriminant/
convergent validity

	α	LMS14	NS	NP	E	MAAS
Sample 3						
MAAS	0.82	0.27***	0.11**	0.16**	0.36***	1
NCS	0.79	0.62***	0.52***	0.53***	0.46***	-0.21**
PA	0.91	0.44***	0.41***	0.38***	0.26***	0.21**
Humor	-	0.32***	0.3***	0.3***	0.15*	-0.09
PNS	0.8	-0.24***	-0.17**	-0.18**	0.22**	-0.12*
NA	0.89	-0.21***	-0.05	0.17**	-0.28**	-0.45***
Need for vacation	-	-0.13*	-0.009	-0.09	-0.21**	-0.24**
Age	-	0.04	-0.016	0.03	0.08	-0.06
Gender	-	0	0.06	0	-0.05	-0.04
Sample 4						
MAAS	0.86	0.355***	0.239***	0.269***	0.377***	1
NCS	0.84	0.64***	0.6***	0.47***	0.44***	0.28***
PA	0.9	0.48***	0.4***	0.42***	0.35***	0.37***
Humor	-	0.3***	0.24***	0.31***	0.15***	0.05*
PNS	0.83	-0.33***	-0.29***	-0.28***	-0.24***	-0.24***
NA	0.9	-0.18***	-0.15**	-0.14**	-0.17**	-0.43***
Need for vacation	-	-0.08*	-0.05*	-0.05*	-0.12**	-0.27***
Age	-	-0.02	-0.03	0.02	-0.05*	0.01
Gender	-	0.01	0.01	0	0	0.02
Sample 5						
FFMQ	0.59	0.37**	0.33*	0.01	0.32*	-
Openness	0.79	0.73***	0.58***	0.71***	0.27*	-
Neuroticism	0.8	-0.27*	-0.25*	-0.25*	-0.08	-

MAAS Mindful Attention and Awareness Scale, NCS need for cognition, PA positive affect, PNS personal need for structure, NA negative affect, FFMQ Five Facets of Mindfulness Questionnaire

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 7 Discriminant validity

	Testing constructs together			Testing constructs separately		
	Covariance = 1			Covariance estimated		
	χ^2	df	CFI	χ^2	df	CFI
LMS and MAAS	3510	372	0.848	1990.2	371	0.92
NCS	4421.3	459	0.836	3236.9	458	0.885
PA	2853.4	247	0.864	1397	246	0.94
NA	4519.9	247	0.784	2514	246	0.885
PNS	5971	294	0.674	2824	293	0.855
FFMQ	254	147	0.849	219	146	0.897

Except for LMS and FFMQ which uses Sample 5 data, all tests conducted using Sample 4 with $N=2258$

MAAS Mindful Attention and Awareness Scale, NCS need for cognition, PA positive affect, NA negative affect, PNS personal need for structure, FFMQ Five Facets of Mindfulness Questionnaire

Describe (0.34; $p < .01$) and Non-judgment items (0.26; $p < .05$).

We find that the LMS is also significantly positively correlated with the need for cognition scale (NCS) ranging from 0.62 to 0.64 in samples 3 and 4, respectively. The subscales of the LMS also highly correlated with the need for cognition scale (NS = 0.52/0.6; NP = .53/0.47; $E=0.46/0.44$;

$p < .001$). Furthermore, we found the LMS to significantly correlate with the personality factor openness to experience with $r = .73$ ($p < .001$) in Sample 5. The subscales correlations with Openness to Experience ranged from 0.27 to 0.71 (NS: 0.58, NP: 0.71, $E=0.27$). The LMS was also consistently significantly correlated with Positive Affect measures (Sample 3: $r = .44$, $p < .001$; Sample 4: $r = .48$, $p < .001$) as

well as humor (Sample 3: $r = .32, p < .001$; Sample 4: $r = .3, p < .001$).

We also find as predicted that the LMS negatively correlates with the personal need for structure scale at $r = -.24, p < .001$ for Sample 3 and $r = -.33, p < .001$ for Sample 4. The subscales also correlated consistently highly (Sample 3: $NS = -0.17$; $NP0 = -.18$; $E = -0.22$; Sample 4: $NS = -0.29$; $NP = -.28$; $E = -0.24$), whereas MAAS only correlated significantly for Sample 4 at $r = -.24 (p < .01)$. Furthermore, we found the LMS to negatively correlate with the personality factor neuroticism with $r = -.27 (p < .01)$ in Sample 5. The subscales of novelty seeking and novelty producing correlated with Neuroticism at $r = -.25$, whereas the engagement subscale did not significantly correlate. The LMS was also consistently significantly and negatively correlated with Negative Affect measures (Sample 3: $r = -.21, p < .01$; Sample 4: $r = -.18, p < .01$) as well as the need for vacation (Sample 3: $r = -.13, p < .05$; Sample 4: $r = -.1, p < .05$).

The LMS was uncorrelated to age and gender (see Table 6).

In addition, to ensure that our mindfulness scale was indeed distinct from the existing scales of mindfulness and closely related concepts, we tested the significant correlations described above—between our mindfulness measure and six other constructs—MAAS, FFMQ, Need for Cognition, Personal Need for Structure, Positive Affect, as well as Negative Affect—via confirmatory factor analysis to ensure that the constructs are distinguishable. Using Sample 4 as the largest sample as well as Sample 5 for the FFMQ-related data, we found that for each construct, a two-factor solution provided a better fit than a single-factor solution for the pairing of LMS with each of the other constructs (see Table 7).

Taken together, the results of phase 3 demonstrate that our measure of socio-cognitive mindfulness is convergent with, yet separable from mindfulness in the Eastern tradition, openness to experience personality trait, need for cognition, positive affect, as well as humor and was significantly different from, personal need for structure, neuroticism personality trait, negative affect, and need for vacation. These findings therefore provide evidence of convergent and discriminant validity for our scale of socio-cognitive mindfulness.

Phase 4: Criterion-Related Validity

This phase tests the criterion-related validity of our mindfulness scale by examining the relationship between socio-cognitive mindfulness and well-being related constructs with which mindfulness should be theoretically linked. Thus, we begin to establish socio-cognitive mindfulness within its nomological network (Dobrow and Tosti 2011; Hinkin 1998). Using mindfulness theory as our guiding theory, we focused on connecting socio-cognitive

mindfulness to a range of behavioral, cognitive, and affective outcomes. Specifically, we establish predictive validity by assessing the LMS to predict three sets of variables it should theoretically be able to predict: psychological well-being, physical well-being, and social well-being.

In Sample 3 and 4, we use cross sectional data, which we corroborate with longitudinal data in Samples 5 and 6. We also included two additional samples to supplement our findings. In addition, we demonstrate that our scale of socio-cognitive mindfulness predicts certain outcomes differently and better than existing scales of meditative mindfulness.

Psychological Well-Being

Mindfulness as cognitive flexibility is understood as the ability to draw novel distinctions which is reflected in novelty seeking, novelty producing, and higher engagement overall. As such mindfulness is theorized to lead to higher levels of psychological well-being (Ryff and Keyes 1995; Ryff and Singer 1998), understood as intrapersonal well-being. Such psychological well-being is heightened via mindfulness not only because of higher awareness levels but also because it can buffer against depression. The ability to draw novel distinctions allows for reappraisal of situations of suffering better than mindless behavior can. Higher levels of mindfulness are also leading to higher probabilities of flow experiences (Csikszentmihalyi 1996) and meaningful personal engagement (Alexander and Langer 1990; Csikszentmihalyi 1997, 2003). Therefore we expect individuals that score higher on our mindfulness scale to also experience higher levels of psychological well-being (Ryff and Keyes 1995). Such higher levels of psychological well-being can also be reflected in higher mental health scores, higher levels of self-esteem, higher subjective well-being measures, and lower negative emotional states. Overall life satisfaction should also mirror such mindfulness effects.

Hypothesis 1a Socio-cognitive mindfulness will be positively related to higher levels of psychological well-being.

Hypothesis 1b Socio-cognitive mindfulness will be positively related to higher levels of mental health.

Hypothesis 1c Socio-cognitive mindfulness will be negatively related to higher levels of negative emotional states.

Hypothesis 1d Socio-cognitive mindfulness will be positively related to higher levels of self-esteem.

Hypothesis 1e Socio-cognitive mindfulness will be positively related to higher levels of subjective well-being.

Hypothesis 1f Socio-cognitive mindfulness will be positively related to higher levels of life satisfaction.

Physical Well-Being

Physical well-being is understood as positive levels of physical health and is therefore separate from psychological well-being, which refers more directly to mental health aspects of well-being. Studies have shown that higher levels of socio-cognitive mindfulness can improve physical well-being (Crum and Langer 2007; Langer 2009; Langer et al. 2010). These effects have been explained by the salience of the mind–body connection according to which the mind and the body are not separate entities but indeed mutually reinforcing each other's reactions. Thus, a higher level of mindfulness will lead to a higher cognitive flexibility which can influence the ability of people to lead a healthy life, enjoy physical activity more, and see themselves as physically capable until old age (Langer 2009). For example, rather than equating old age with physical decay, mindful people tend to cognitively dissociate the two and are able to enjoy physical activity according to age. They also do not stigmatize old age but positively embrace it often seeming younger objectively (Pirson et al. 2012). We thus expect socio-cognitive mindfulness to correlate with levels of physical health. Such positive impact on physical health should be visible when measuring reaction times, and reporting perceptions of own age. Furthermore, socio-cognitive mindfulness can influence the personal ability to deal with pain as higher levels of mindfulness allow individuals to process pain in a variety of manners. Such positive dealings with pain, for example, during labor should have positive impact on the physical health of newborns.

Hypothesis 2a Socio-cognitive mindfulness will be positively related to higher levels of physical well-being.

Hypothesis 2b Socio-cognitive mindfulness will be positively related to shorter reaction times.

Hypothesis 2c Socio-cognitive mindfulness will be positively related to more positive perceptions of own age.

Hypothesis 2d Socio-cognitive mindfulness will be positively related to lower levels of reported pain during labor.

Hypothesis 2e Socio-cognitive mindfulness will be positively related to higher levels of physical health of newborns.

Social Well-Being

We label those aspects of well-being relevant for groups and organizational contexts of social well-being constructs. The

life within organizations is determined by social relationships and the quality of such relationships will determine in large part the level of organizational well-being (e.g., Argyris 1956; Ferris et al. 2008). Socio-cognitive mindfulness can influence the quality of social relationships via the ability to draw novel distinctions. This ability allows individuals to constantly reassess and mindfully interpret social actions. Individuals who are low in mindfulness will stick to routine judgments and stereotyping of others often missing potential alternative explanations of behavior. Individuals who are high in mindfulness will allow for alternative explanations and possibly give the benefit of the doubt to coworkers, as such increasing the likelihood for positive relations overall. Mindfulness should also impact the individual level of job satisfaction not only because of the higher quality of social relationships but also because a mindful reinterpretation of job tasks can counteract boredom that may ensue from routine. Cognitive flexibility will allow employees to take different perspectives on their job-related tasks and mindfully reinvent and improve context interpretations to enjoy work more. Similarly, employee engagement should similarly be influenced by socio-cognitive mindfulness because the creation of novel distinctions can lead to higher levels of joy at work, higher levels of dedication to the tasks, and higher perceived ability to have impact. Furthermore, such mindfulness effects on learning should also be seen at the level of creativity, where the drawing of novel distinctions directly contributes to work success. Finally, such higher levels of socio-cognitive mindfulness should also be reflected in decision-making. We expect more mindful individuals to take decisions that are more complex, take more information into account, and serve overall societal well-being better.

Hypothesis 3a Socio-cognitive mindfulness will be positively related to higher levels of social well-being.

Hypothesis 3b Socio-cognitive mindfulness will be positively related to higher levels of job satisfaction.

Hypothesis 3c Socio-cognitive mindfulness will be positively related to higher employee engagement.

Hypothesis 3d Socio-cognitive mindfulness will be positively related to higher levels of creativity.

Hypothesis 3e Socio-cognitive mindfulness will be positively related to better decision-making.

Differential Effect of LMS over Other Scales

Whereas Eastern and Western mindfulness have conceptual overlap especially in the area of engagement, respective

measures will be able to associate with different criteria differently well. We expect measures of socio-cognitive mindfulness to do similarly well as the meditative mindfulness measures in associating with psychological well-being. We expect the socio-cognitive measure to outperform the meditative measures in the area of social and organizational well-being.

Method

Participants and Procedure Participants were the same ones introduced in Phase 2 as Samples 2–6. In addition, we collected two more samples, Sample 7 and Sample 8, to examine additional criterion-related outcomes. Table 2 displays a complete overview of measures used in each sample.

Measures

Psychological Well-Being Psychological well-being: We used two subscales of Ryff and Keyes (1995) Psychological Well-Being Scale, namely, Purpose in Life and Personal Growth. For each of the subscales we used the 9-item version with a 7-point Likert scale which has demonstrated solid internal validity and reliability (Ryff and Keyes 1995). Cronbach's alphas ranged 0.83 for purpose in life subscale and 0.81–0.84 for personal growth subscale.

Mental health: We assessed mental health in Sample 6 with the Mental Health Inventory (MHI; Veit and Ware 1983). Cronbach's alphas for both psychological well-being (0.79–0.89) and psychological distress (0.86–0.94) were satisfactory for all 3 measurements points.

Negative emotional states: We measured three negative emotional states: Depression, Anxiety, and Stress using the DASS-21 (DASS; Lovibond and Lovibond 1995). Cronbach's alphas ranged from 0.77 to 0.94 (Sample 6).

Self-esteem: We assessed self-esteem with the Rosenberg Self-Esteem Scale (RSE; Rosenberg 1979), which is a 10-item self-report scale. Cronbach's alphas were satisfactory for all 3 measurements points (0.83–0.86). In addition, we measured self-esteem using the Single-Item Self-Esteem scale (SISE; Robins et al. 2001).

Subjective well-being: We measured Subjective Well-Being with the Subjective Happiness Scale (Lyubomirsky and Lepper 1999). Cronbach's alphas ranged from 0.87 to 0.88.

Satisfaction with life: We measured general satisfaction with life with the Satisfaction with Life Scale (SWLS; Diener et al. 1985). Cronbach's alphas were high for all 3 measurements points (0.88–0.91).

Physical Well-Being Physical well-being: We assessed physical well-being in two ways. First by asking for self-

reports and second by asking for professional third-party assessments (Sample 7).

Reaction time: We measured reaction time by integrating a web-based reaction time test that asked participants to react to a change of a traffic light from red to green. Reaction time was measured and the average of 5 trials was then returned to the participant, who entered it in our survey in units of milliseconds (we control for age).

Perceptions of age: We measured participants' own assessment of their physical state by asking them about perceptions of their own age. We created a 4-item measure asking respondents to state, how much they agreed with the statement that they (1) felt much younger than their age, (2) that others said they look younger than their age, (3) that they felt good with themselves, and (4) that they embraced life no matter what age. Cronbach's alpha for this scale was 0.7.

Pain during labor: We indirectly measured pain during labor by the usage of pain medication during the labor process as provided by the doctors affiliated with the study.

Physical well-being of newborn: We assessed the physical health of a newborn baby using the APGAR scores reported by the hospital doctors affiliated with the study. APGAR scores are measured twice in the first 10 min of life of a newborn and range from 1 (low) to 10 (high) for two categories.

Social Well-Being Social well-being: We used the 'Positive Relations with Others' subscale of Ryff and Keyes' (1995) Psychological Well-Being Scale. The Cronbach's alpha for Samples 4 and 5 ranged from 0.86 to 0.87. As a further measure of social well-being we measured attachment orientations in close human relationships (ECR; Brennan et al. 1998). Cronbach's alpha for both dimensions ranged from 0.9 to 0.92.

Job satisfaction: To assess job satisfaction we used a combined measure of four items reflecting the general satisfaction (Hackman and Oldham 1975; Spector et al. 1997). Participants were asked to rate their agreement with the following four statements using a 7-point Likert scale: (1) I enjoy my job, (2) I am very satisfied at my work, (3) I truly appreciate the difference I can make through my job, and (4) I have a meaningful job. The Cronbach's alphas ranged from .91 to .94.

Employee engagement: To measure employee engagement we used the Gallup Employee Engagement Questionnaire (Harter et al. 2002).

Creativity: We used a combination of two creativity tasks, which ask participants to come up with as many as possible alternative usages for (1) a brick and (2) a pencil. The responses were coded (1) for the quantity of alternatives listed and (2) for the quality. Two independent reviewers assessed the responses and scored the creativity of the responses. Inter-rater reliability was high (0.8).

Decision-making: All participants took part in a 40–60 min computer-based study, where they made hypothetical investment allocation decisions and completed as well as the LMS 14. The quality of decision-making was judged by the ability to refrain from being influenced through framing and by taking more information into account as evidence through the allocation decision itself as well as the coded reasons (see Chow 2012).

Results

Psychological Well-Being We find that psychological well-being (H1a) measured by Ryff's subscales of Purpose in Life and Personal Growth are significantly correlated with the LMS14 and its sub-constructs (see Table 8). As predicted we also find that the LMS 14 is significantly correlated with mental health (H1b) yet uncorrelated with distress. Furthermore we find that LMS 14 at T1 is significantly associated

Table 8 Criterion-related validity

Criterion	Sample	Cronbach's alpha	LMS14	NS	NP	E
Psychological well-being						
Purpose in life (Ryff)	3,4	0.83, 0.83	0.46***, 0.43***	0.3***, 0.31***	0.35***, 0.36***	0.43***, 0.43***
Personal growth (Ryff)	3,4	0.81, 0.84	0.65***, 0.59***	0.49***, 0.53***	0.49***, 0.45***	0.55***, 0.46***
(MHI) Psychological WB	5	0.79–0.89	0.25**(t1), 0.16(t2), 0.24*(t3)	0.20*(t1), 0.19*(t2), 0.23*(t3)	0.29**(t1), 0.09(t2), 0.16(t3)	0.07(t1), 0.12(t2), 0.22*(t3)
(MHI) Psych. distress	5	0.86–0.94	–0.12, –.15, –.06	–0.13, –.17, –.10	–0.09, –.09, –.01	–0.07, –.12, –.06
Self-esteem (RSE/SISE)	5	0.83–0.86	0.33 (t1)**, 0.34(t2)**	0.33(t1)**, 0.29(t2)*	0.29 (t1), *.31(t2)**	0.12
Subjective well-being	3,4	0.87, 0.88	0.32***, 0.33***	0.25***, 0.43***	0.27***, 0.33***	0.25***, 0.13***
Life satisfaction	3,4,5	0.88–0.91	0.15*, 0.32***, 0.31***	0.13, 0.27***, 0.27***	0.16**, 0.28***, 0.21*	0.11, 0.24**, 0.22*
Negative emotional states (DASS)	6	0.77–0.94	0.22*	0.26**	0.22*	0.01
Physical well-being						
Self-reported health	6	–	0.06(t1), 0.17(t2)	0.04(t1), 0.16(t2)	0.12(t1), 0.02(t2)	0.03(t1), 0.26*(t2)
Nurse assessed health: strength	7	–	0.33*	0.35*	0.17	0.21
Flexibility	7	–	0.38*	0.41*	0.38*	0.36*
Reaction time	3	–	0.1*	0.06	0.05	0.12**
Perceptions of aging	4	0.7	0.37***	0.34***	0.31***	0.25***
Pain during labor	5	–	not tested with correlations			
APGAR	5	–	0.24*(t1); 0.27*(t2)	0.21(t1), 0.23(t2)	0.22(t1), 0.24*(t2)	0.08(t1), 0.11(t2)
Social/organizational well-being						
Positive relations with others (Ryff)	3,4	0.86, 0.87	0.38***, 0.31***	0.21***, 0.2***	0.25***, 0.27***	0.43***, 0.3***
Attachment anxiety (ECR)	6	0.9/0.92	–0.26*(t1), –.18*(t2)	–0.09(t1), – 0.15(t2)	–0.18*(t1), – 0.12(t2)	–0.33**(t1), –.24(t2)
Attachment avoidance (ECR)	6	0.9/0.92	–0.19*(t1), –.18*(t2)	–0.21*(t1), –.01(t2)	–0.14(t1), –.2(t2)	–0.27**(t1), –.41**(t2)
Job satisfaction	3,4	0.94, 0.91	0.22***, 0.21***	0.15**, 0.16***	0.17**, 0.19***	0.21**, 0.15***
Employee engagement (Gallup)	4	–	0.27***	0.3***	0.22***	0.1**
Creativity	3	0.8^	0.42***	0.28***	0.31***	0.39***
Decision-making	8	–	0.19*			

* $p < .05$; ** $p < .01$; *** $p < .001$

^Interrater reliability

with well-being at later times. This pattern is evidenced in the sub-constructs as well (see Table 8). Furthermore, we find that LMS14 is significantly negatively correlated with depression measured using the DASS (H1c) ($r = -.22$; $p < .05$).

We similarly find that LMS14 significantly correlates with self-esteem (H1d) at time 1 ($r = .33$; $p < .01$) and is associated with self-esteem at time 2 one year later ($r = .34$; $p < .01$). These predictive effects are driven by the subscales of novelty seeking ($t1$: $r = .33$; $p < .01$; $t2$: $r = .29$; $p < .05$) and novelty producing ($t1$: $r = .29$; $p < .01$; $t2$: $r = .31$; $p < .05$), whereas engagement does not correlate.

Also, as predicted, we find that the LMS14 and the sub-constructs correlate strongly with subjective well-being measures (H1e) across samples 3 and 4 (see Table 8).

Finally, we find that across the various samples we find a consistent correlation of LMS14 and Life satisfaction (H1f), which is mirrored in each of the LMS subscales (see Table 8). In Sample 5, LMS14 at time 1 correlates significantly with Life Satisfaction at time 2 and time 4 (time 3 Life satisfaction is predicted only by the NS subscale, which we explain with the novel situation of having a child, which also confounds other aspects of life satisfaction).

Physical Well-Being As predicted, we find that the LMS14 was significantly correlated with physical health conditions (H2a) of participants in Sample 7. Third-party assessments of health (e.g., physical flexibility and strength) correlated with the LMS14 and its subscales in the elderly population. We also find that self-assessed health states of student participants of Sample 5 were positively correlated with the engagement factor of the LMS one year earlier ($r = .25$; $p < .05$), controlling for prior physical health levels ($\beta = 2.28$, $p = .02$).

In addition, we discovered that reaction times (H2b) significantly correlate with the LMS14 ($r = .1$; $p < .05$) and especially with the subscale of engagement ($r = .123$; $p < .01$). We furthermore find that positive perceptions of one's own age (H2c) and LMS14 scores are significantly correlated at $r = .374$, ($p < .001$). While we did not find the entire LMS14 correlate significantly with lower levels of pain (H2d) during delivery, we found the subscale of Novelty Seeking significantly correlated with the amount of induction medication given [$\chi^2(1) = 5.11$, $p < .05$]. Participants with above median Novelty Seeking scores were less likely to receive induction medication (34.5% of High NS) than participants with below median Novelty Seeking scores (62.9% of Low NS). In addition, Novelty Seeking at time 1 was significantly associated with second-stage labor duration [$t(55) = 1.25$, $p < .05$]. High Novelty Seeking mothers experienced a lower duration of second-stage labor ($M = 72.52$ min, $SD = 69.58$) compared to Low Novelty Seeking mothers ($M = 135.23$ min, $SD = 118.62$) with

a significant effect size (Cohen- d : 0.61). Finally, we find that LMS14 scores of mothers significantly correlated with health of newborns as measured by the APGAR scores (H2e). The APGAR scores immediately after birth ($r = .24$; $p < .05$) as well as 5 min after birth ($r = .27$, $p < .05$) were both significant.

Social Well-Being As suggested we find that LMS14 associated strongly with positive relations with others (H3a). We found that LMS14 significantly correlates with Ryff's subscale of positive relations with others ($r = .38$; $p < .001$ for Sample 4 and $r = .31$; $p < .001$ for Sample 5). In addition, we detect that LMS negatively correlates with attachment anxiety ($r = -.26$; $p < .05$) and attachment avoidant behavior at time 1 ($r = -.19$; $p < .05$) and time 2 ($r = -.18$; $p < .05$) seemingly driven by the engagement subscale (Table 8). We further find that LMS14 significantly relates to job satisfaction (H3b) in samples 3 and 4 ($r = .23/.21$; $p < .001$) with all subscales also significantly correlating (see Table 8). Furthermore, we find that the LMS14 correlates significantly with employee engagement (H3c) scores ($r = .27$; $p < .001$) with subscales ranging from 0.1 (E) to 0.22 (NS) and 0.3 (NP). In addition, we find significant correlations of LMS14 scores and our creativity (H3d) measures ($r = .23$; $p < .05$), whereas MAAS remains uncorrelated.

Similarly, we discovered that mindfulness influences decision-making (H3f). Specifically, we find that high trait mindfulness individuals ($M = 860.23$, $SD = 187.75$) did invest more in attractive investments than low trait mindfulness individuals [$(M = 789.14$, $SD = 230.49)$, $t(99) = -1.70$, $p < .05$] yet the effect size is $d: 0.35$ using a one-tailed significance. We also find that high mindfulness participants had a significantly higher propensity to invest in social responsible investments ($r = .187$; $p < .05$). Finally, we find that the LMS14 correlated with decision-makers ability to resist priming in the given decision tasks (see also Chow 2012).

Differential Predictive Ability of LMS over MAAS/FFMQ As we developed the LMS14 as a measurement scale for socio-cognitive mindfulness, we were interested in examining the differences between Western and Eastern-based measurement scales. We found that LMS and MAAS similarly well correlated with well-being, life satisfaction, and the need for vacation. However, the LMS and not the MAAS correlated with Humor, Reaction time, and Creativity tasks. The FFMQ was overall not very reliable (α of 0.5) and low correlations with some of the constructs indicated a less powerful predictive capacity with regard to psychological and social well-being (e.g., DASS and Attachment avoidance scores were uncorrelated with FFMQ) compared to the LMS 14.

Discussion

Despite the increasing amount of research on mindfulness in clinical and social psychology as well as organizational behavior and adult development, there has not been much research to measure mindfulness in a way that connects personal development with a perspective on social and organizational contexts of mindfulness. Our purpose in this study was to articulate a clear Western and socio-cognitive understanding of mindfulness supportive of adult development and develop a reliable and valid scale to measure this conceptualization of mindfulness. Future work can be built on this contribution by examining further interventions in terms of adult development, health, and well-being in the elderly cohorts and possibly do longitudinal effect studies. Data could be collected to examine age groups, e.g., emerging adults, young adults, middle-aged adults, older adults. Research could explore the levels of mindfulness and their effects of an aging population and how aging can be done well.

Our work on the effects of mindfulness on pregnant women could serve as a stepping stone for further such research. Why would it be that more mindful women have better pregnancies and healthier babies? What could be learned from mindfulness interventions for pregnant women that can help, i.e., with post-partum depression? This work can be expanded to include perspectives on other critical incidents of adulthood, such as marriage, parenthood, retirement, divorce, death, or coping with life-changing events such as immigration.

Furthermore, the present work could be a stepping stone for outcome measures of mindfulness that can help assess individual development throughout psychotherapy or other related educational interventions. Ultimately we suggest that this scale can serve as a trans-disciplinary bridge for mindfulness research across the fields and can help practitioners in the clinical, medical, social, and organizational occupations to advance their work in better understanding on how individuals can become productive and flourish as well as contribute to flourishing groups and organizations.

Appendix [LMS 21 with LMS14 Information in ()]

1. I like to investigate things. (1/NS)
2. I generate few novel ideas. (2/NP)
3. I am always open to new ways of doing things.
4. I “get involved” in almost everything I do.
5. I do not actively seek to learn new things.

6. I make many novel contributions. (3/NP)
7. I stay with the old tried and true ways of doing things.
8. I seldom notice what other people are up to. (4/E)
9. I avoid thought-provoking conversations. (5/E)
10. I am very creative. (6/NP)
11. I can behave in many different ways for a given situation.
12. I attend to the “big picture.”
13. I am very curious. (7/NS)
14. I try to think of new ways of doing things. (8/NS)
15. I am rarely aware of changes. (9/E)
16. I have an open-mind about everything, even things that challenge my core beliefs.
17. I like to be challenged intellectually. (10/NS)
18. I find it easy to create new and effective ideas. (11/NP)
19. I am rarely alert to new developments. (12/E)
20. I like to figure out how things work. (13/NS)
21. I am not an original thinker. (14/NP)

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