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Curiosity has comprehensive benefits in the workplace: Developing and validating a multidimensional workplace curiosity scale in United States and German employees



Todd B. Kashdan^{a,*}, Fallon R. Goodman^a, David J. Disabato^a, Patrick E. McKnight^a, Kerry Kelso^a, Carl Naughton^b

^a George Mason University, Fairfax, VA, United States

^b Braincheck

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ABSTRACT

Curiosity is a fundamental human motive that is beginning to garner closer attention by researchers and practitioners interested in workplace functioning. Recent work suggests that rather than designating someone as possessing curiosity or not, there is benefit in detailing the various elements of curiosity. To date, there is no research on how multiple dimensions of curiosity operate in the workplace. Across four samples, we developed and validated the M-Workplace Curiosity Scale. Participants were American and German employees from a range of industries. We found evidence for four workplace curiosity dimensions: Joyous Exploration, Deprivation Sensitivity, Stress Tolerance, and Openness to People's Ideas. These workplace curiosity dimensions predicted a substantial amount of variance in adaptive outcomes including job satisfaction, work engagement, job crafting, healthy work relationships, and innovation; as a test of construct specificity, workplace curiosity outperformed trait mindfulness in predicting each of these workplace outcomes. Results offer support for a comprehensive model of curiosity that identifies high performing, satisfied individuals in the workplace. These findings underscore the importance of understanding, assessing, leveraging, and developing curiosity in teams and organizations.

There is a long history of using personality assessments to predict work performance in organizations (Barrick, Mount & Judge, 2001). Work outcomes typically include the successful completion of tasks and “the intentional creation, introduction and application of new ideas within a work role, group or organization, in order to benefit role performance, the group, or the organization” (Janssen, 2000, p. 288). These elements of work—performance and innovation—are common indicators of success in the workplace. Beyond workplace success, it is worthwhile to extend the value of personality assessments to predict which workers experience job satisfaction, work engagement, healthy relationships, and craft or customize tasks and interactions to be fulfilling (e.g., Weiss & Rupp, 2011; Wrzensniewski & Dutton, 2001). In a world where work environments are increasingly volatile, uncertain, complex, and ambiguous (VUCA), there is increased value in distilling personality attributes that best predict who will be successful and fulfilled at work. In the present research program, we argue for increased attention on a particular personality dimension that has been neglected in organizational research and practice: curiosity.

1. Curiosity in the workplace

The immediate function of curiosity is to seek out, explore, and immerse oneself in situations with potential for new information and/or experiences (Berlyne, 1978; Spielberger & Starr, 1994). In the longer term, consistently acting on curious feelings serves to expand knowledge, build intellectual and creative capacities, and strengthen social relationships (von Stumm & Ackerman, 2013; von Stumm, Hell & Chamorro-Premuzic, 2011).

Given the motivational and behavioral contributions of a curious person, the relevance to organizations is readily apparent (Mussel, 2013). A psychological strength such as curiosity is potentially valuable for the rapid learning required to manage trends in the modern workplace. A curious person is responsive to organizational changes; they are more intrigued than frustrated when trying to understand, appreciate, and extract the unique value of new colleagues and technologies, and flexible enough to adapt strategies and plans to unfamiliar cultures in sophisticated global markets (Mussel, 2013;

* Corresponding author at: Department of Psychology, MS 3F5, George Mason University, Fairfax, VA 22030, United States.

E-mail address: tkashdan@gmu.edu (T.B. Kashdan).

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Neubert, Mainert, Kretschmar & Greiff, 2015).

There is a small body of research on curiosity in the workplace. In research on working adults, curiosity has been positively linked to idea generation (Hardy, Ness & Mecca, 2017), job performance (Reio & Callahan, 2004), and commitment to organizations (Mussel & Spengler, 2015). As for improving work performance, curious workers are more apt to proactively seek feedback, ask open-ended questions during the acquisition of feedback, and effectively cope with ambivalent feedback from coworkers and supervisors (Harrison & Dossinger, 2017). While there is a relative absence of empirical research on curiosity and creativity, theories suggest that curiosity might serve as an antecedent and in addition, facilitates the ability to deal with the uncertainty that arises from contact with original ideas, products, and processes at work. With a careful delineation of the feelings, thoughts, and behaviors that encapsulate curiosity in the workplace, researchers can investigate whether and how curiosity predicts work success and fulfillment. Clarification of the enablers and barriers to curiosity that exist in job tasks and environments can steer leadership in the direction of effective innovation (Sackett & Walmsley, 2014).

2. Individual differences in curiosity

Based on a literature review, there appears to be several dimensions of curiosity that belong in any work related measure. First, any measure of curiosity must distinguish between a general fascination with new information and experiences from the intrinsic desire to resolve an information gap (Loewenstein, 1994). Viewing foreign travel as a pleasurable way to interact with colleagues and learn about their culture (Leung, Maddux, Galinsky & Chiu, 2008) is a qualitatively different experience than being unable to sleep until an answer is obtained for an ongoing problem (Litman, 2005). But there is more to curiosity than these two facets.

Second, whether someone experiences curiosity is contingent on two automatic, rapid judgments. The more obvious judgment is whether a person believes there is potential for novelty in a situation, task, object, or person. If sufficient novelty potential is present, a person's attention is more apt to be captured and held. The less obvious judgment is that a person must also believe they possess adequate mental faculties to cope with the distress or negative emotions that arise from engaging new, complex, uncertain, unfamiliar, or uncharted stimuli (Silvia, 2005, 2008). For a person to be curious, they must believe there is sufficient novelty potential and believe they can cope with or manage this novelty.

Third, human beings are social creatures, and the degree to which a person feels a sense of belonging has a large influence on how fulfilled they feel at work and more generally in life (e.g., Diener & Seligman, 2002; Thau, Aquino & Poortvliet, 2007). Humans are intrigued by and gravitate towards others for a host of social benefits: comfort, excitement, commiseration, and so on. Curiosity in the social world warrants consideration as a separate dimension (Litman & Pezzo, 2007; Renner, 2006). Within the workplace, people's viewpoints and ideas are arguably their most important characteristic. While some people might become defensive and not wish to learn outside perspectives, the socially curious person is open to a diversity of opinions and yearns to understand them more completely.

3. The current research program

Our research program organizes rich theories and methodologies of prior scientists into a single framework of curiosity at work. This includes the development of a multidimensional work related curiosity scale. By capturing the range of dimensions that exist, researchers will find it easier to explore the origins, correlates, and consequences of curiosity, and practitioners will be better able to intentionally select for and enhance curiosity in the workplace.

Incorporating a cross-cultural perspective, we collected data from

four samples of employees in the United States and Germany. Using two distinct studies, we created and validated the M-Workplace Curiosity Scale. Item content included four facets of curiosity that reflect intrinsically enjoyable explorations (i.e., Joyous Exploration), tension-laden searches until information gaps are resolved (i.e., Deprivation Sensitivity), the perceived ability to cope with new, uncertain, complex, and ambiguous situations (i.e., Stress Tolerance), and the desire to discern the thoughts, ideas, and potential of other people (i.e., Openness to People's Ideas).

Based on theory and research, there are certain workplace variables that appear to be of primary relevance to the nomological net when evaluating the construct of work related curiosity. Upon searching for new information and experiences, and linking them together, curiosity appears to be central to the idea generation phase of creative thinking (e.g., Amabile, 1988; Mumford & Hunter, 2005; Mussel, 2013; Wu, Parker & De Jong, 2014). For this reason, we included an index of creative or innovative behavior in Studies 1 and 2. Based on the only study that moves beyond general curiosity, we hypothesized that Deprivation Sensitivity would have the weakest correlation with innovation compared to the other dimensions (Hardy et al., 2017). Other work suggests that curious people engage in proactive goal-directed efforts at work such as asking questions, investigating data, and finding interesting people, objects and situations to invest their time and energy in. These proactive behaviors increase the probability that curious people will experience a higher level of engagement and less emotional exhaustion or burnout when working (e.g., Bakker, Vergel & Kuntze, 2015; Thoman, Smith & Silvia, 2011). Based on this recent body of work, we included measures of work engagement that capture the presence of emotional vigor, task absorption, dedication to tasks, along with measures of work burnout that capture the aversive states of disengagement and emotional exhaustion. Existing work on this topic has been limited to educational settings. We hypothesized that curiosity would predict similar high levels of work engagement and low levels of burnout in adult employees. To date, no study has examined the relevance of particular curiosity dimensions to these workplace outcomes. We hypothesized that Stress Tolerance and Openness to People's Ideas would be most relevant because the successful management of turbulent emotions (high Stress Tolerance) and the social friction of diverse perspectives in the workplace (high Openness to People's Ideas) are often mentioned as effective strategies for building healthy individuals, groups, and organizations (e.g., Härtel, Cooper & Ashkanasy, 2008).

We also included measures of proactive work behaviors that have been previously linked to curiosity (Wang & Li, 2015). We focused on job crafting, or the ability to transform the potentially mundane aspects of work into a more stimulating and challenging environment, and securing the resources to achieve these goals (Wrzesniewski, LoBuglio, Dutton & Berg, 2013). As a bottom-up intervention conducted by employees to create an ideal work environment, job crafting has been theoretically but not empirically linked to curiosity; thus, we consider tests of association with the curiosity dimensions to be exploratory in nature. To our knowledge, the only published study on the relevance of work related curiosity to social competence found a strong 0.56 correlation. With this promising initial finding, we included a measure of perceived social support from colleagues and supervisors at work to test the hypothesis that Openness to People's Ideas would be the curiosity dimension with the greatest link to social capital — a fundamentally important feature of success and fulfillment at work (Ng & Sorensen, 2008). Finally, curiosity has been proposed to be linked to work well-being as a function of several of the aforementioned constructs. We used job satisfaction as an index of work well-being with the hypothesis that Joyous Exploration, Stress Tolerance, and Openness to People's Ideas would be the stronger predictors; Deprivation Sensitivity, as a desire to acquire information and experiences that are not present, is likely to be irrelevant to job satisfaction (Litman, 2005; Loewenstein, 1994). Taken together, these variables formed our battery of outcomes in the second study after the

Table 1
Demographic data for studies 1 and 2.

	Study 1: Community (U = United States sample; G = German sample)	Study 2: MTurk (U = United States sample; G = German sample)
Sex	U = 54.8% women; G = 43.4%	U = 48.2% women; G = 55.2%
Age (years)	U = 8.4% were 18 to 24; G = 7.2% U = 31.8% were 25 to 34; G = 24.4% U = 17.4% were 35 to 44; G = 25.5% U = 18.7% were 45 to 54; G = 25.0% U = 16.3% were 55 to 64; G = 16.2% U = 7.3% were 65 and older; G = 1.7%	U = 35.63 (SD = 10.06) G = 35.48 (SD = 11.49)
Race/Ethnicity	No data were collected	U = 78.7% White; G = 95.5% U = 9.1% African American; G = 0% U = 7.5% Asian/Pacific Islander; G = 2.4% U = 3.9% Hispanic, Latino; G = 0% U = 0.8% other (G = 1.7% Turkish and 0.3% Arabic)
Employment status	U = 100% full-time; G = 100%	U = 88.2% full-time; G = 91.6% U = 9.5% part-time; G = 0.5% U = 2.3% self-employed; G = 7.9%
Relationship status	No data were collected	U = 31.1% single; G = 39.1% U = 44.9% married; G = 31.7% U = 17.6% long-term monogamous relationship; G = 23.8% U = 4.7% separated or divorced; G = 1.3% U = 1.4% short-term monogamous relationship; G = 3.5% U = 0.2% other
Highest Education	No data were collected 10.3% Associate's 3.3% post graduate non-degree seeking 4.9% Doctoral/professional degree .2% some high school	U = 12.4% professional/graduate degree; G = 20.8% U = 4.8% some professional/graduate school; G = 1% U = 40.4% college/university graduate; G = 21.3% U = 19.7% some college/university classes; G = 8.9% U = 1.9% trade/technical school graduate; G = 21.3% U = 8.7% high school degree; G = 15.3% U = 0.2% some high school; G = 11.4%

measurement scale was finalized.

To test construct specificity, we included a conservative test of whether curiosity accounts for greater variance in innovative work behaviors, work engagement and burnout, job crafting, the presence of healthy social relationships at work (that is, coworker support), and job satisfaction than the more widely studied construct of mindfulness in the workplace (Dane, 2011; Good et al., 2016).

4. Study 1: developing a multidimensional work curiosity scale

Few studies have empirically examined the relevance of curiosity to workplace outcomes (e.g., Reio & Wiswell, 2000), and only one study has empirically evaluated a work related curiosity scale (Mussel, Spengler, Litman & Schuler, 2012). The latter presented a single dimension that broadly captures “persisting in exploratory behaviors until desired information is obtained or problems are solved” (p. 110, Mussel et al., 2012). Our work aims to complement Mussel by addressing the comprehensive, hierarchical structure of curiosity.

Since the publication of the German Work-Related Curiosity Scale, additional work with nationally representative United States samples found support for five related but distinct trait curiosity dimensions (Kashdan et al., 2018). To date, there has been no research on these first-order dimensions of work related curiosity that might lie beneath a higher-order, general factor. Two dimensions are distinct in their emotional content: there is a joyous exploration factor (synonymous with interest-type curiosity) and an unpleasant state of uncertainty that persists until an information gap is closed/resolved (synonymous with deprivation-type curiosity) (Litman & Jimerson, 2004). Joyous exploration predicted behavioral indicators of creative problem-solving and performance whereas deprivation sensitivity did not (Hardy et al., 2017). Combining these two curiosity dimensions together would obfuscate their differential downstream effects. Besides joyous exploration and deprivation sensitivity, additional curiosity dimensions uncovered include the perceived ability to tolerate the stress of exploring new territory (stress tolerance) and an interest in other people's ideas and

behaviors (social curiosity). Our goal was to conduct a comprehensive exploration of this hierarchical structure of curiosity in the workplace and identify the psychological benefits of particular dimensions. To refine research and practice on curiosity in the workplace, we started with a theoretically and empirically grounded assumption that there will be evidence for a multidimensional framework of curiosity in work related situations. To our knowledge, this is the first attempt to intentionally include cross-cultural reliability and validity as criteria in developing and refining a measure of curiosity (e.g., Geisinger, 1994; Heine & Norenzayan, 2006).

5. Method

5.1. Sample and procedure

We generated an initial pool of 92 items to assess the experience of curiosity in the workplace. The item content reflected existing work from a 3-factor model of curiosity consisting of a joyous search for new information and experiences, social curiosity, and thrill seeking (Reio, Petrosko, Wiswell & Thongsukmag, 2006), as well as a 5-factor model that added a feeling of deprivation until problems are solved and the perceived ability to tolerate the anxiety of confronting the new (Kashdan et al., 2018).

Four independent, subject matter experts were recruited by Merck, KGaA, Darmstadt, Germany for their expertise as researchers and practitioners in organizational behavior and innovation to evaluate items. We presented the items to these subject matter experts to assess their representativeness and fit to definitions of the curiosity dimensions. Each expert received a website link with a randomized list of the 92 items and the definition of each curiosity dimension. We asked them to rate each item on a Likert scale for its relevance to each dimension with space to refine or discard the item with an accompanying rationale. They were also asked to suggest whether additional dimensions or items were needed. Following these independent ratings, a facilitator worked with them as a group to determine recommendations to

Table 2
Correlations, Means, Standard Deviations, and Alphas for the M-Workplace Curiosity Scale (Studies 1 & 2).

Subscales	JE	DS	ST	OP
Joyous Exploration	–	.63* (0.57*)	.65* (0.67*)	.45* (0.49*)
Deprivation Sensitivity	.63* (0.58*)	–	.43* (0.40*)	.37* (0.36*)
Stress Tolerance	.56* (0.52*)	.49* (0.53*)	–	.40* (0.52*)
Openness to People's Ideas	.50* (0.50*)	.55* (0.57*)	.56* (0.58*)	–
USA Mean (Study 1/2)	3.59 / 3.42	3.84 / 3.64	3.43 / 3.19	3.88 / 3.66
USA SD (Study 1/2)	.96 / 0.86	.80 / 0.77	.83 / 0.98	.81 / 0.77
USA Alpha (Study 1/2)	.69 / 0.84	.74 / 0.85	.81 / 0.88	.82 / 0.89
German Mean (Study 1/2)	3.48 / 3.43	3.71 / 3.56	3.50 / 3.33	3.75 / 3.55
German SD (Study 1/2)	.95 / 0.78	.84 / 0.66	.80 / 0.76	.81 / 0.65
German Alpha (Study 1/2)	.70 / 0.83	.74 / 0.80	.79 / 0.81	.78 / 0.86

Notes. JE = Joyous Exploration dimension. DS = Deprivation Sensitivity dimension. ST = Stress Tolerance dimension. OP = Openness to People's Ideas dimension. A few items are different for Study 1 (initial scale) and Study 2 (final scale). Correlations for Study 1 are below the diagonal; correlations for Study 2 are above the diagonal. For the correlation matrix, United States data are presented outside of parentheses and German data are presented inside parentheses. * = significant at the 0.01 level.

remove, add, and revise items. Based on ratings of individual items and conceptual discussions, the experts reached a consensus on a refined list of 53 items.

5.2. Participants

We recruited 1,067 working adults from the United States (54.8% women) and 1,040 from Germany (43.4% women) for an online survey. Age ranged between 18 and 65 years with a modal response between 35–44 years old. In the United States sample, 35.2% endorsed working at senior level positions, 37.2% middle level, and 27.5% junior level; in the Germany sample, 32% endorsed senior level positions, 35.9% middle level, and 32.1% junior level. Demographic data for both samples are reported in Table 1. To respect the privacy of full-time employee participants, several demographic questions were not asked.

5.3. Procedure

Participants were recruited from a data collection company, received an email invitation, and were directed by email to an online survey that required approximately 20 min to complete. Respondents received financial compensation from the survey company via virtual currency (approximately \$5) that could be used for airline miles, hotel points, store coupons, and magazine subscriptions.

5.4. Measures

Participants completed a preliminary pool of 53 curiosity items; ratings were made on a 5-point Likert scale (1 = *very slightly or not at all*, 2 = *a little*, 3 = *moderately*, 4 = *quite a bit*, 5 = *extremely*). Additionally, participants responded to demographic and work related questions, including a 3-item measure of innovation propensity (Dobni, 2008). Items included “I seek out information on what most would consider the ‘not so obvious’ or even obscure”, “I take the time to understand my organization's competitive environment to the point where I can begin to anticipate industry shifts”, and “I actively search for new ideas and innovations at all stages of product/ service development.” Participants responded to items on a 5-point Likert scale from 1 = *not descriptive* to 5 = *exactly descriptive*. Reliability for the innovation propensity scale was acceptable in both samples (United States $\alpha = 0.81$; German $\alpha = 0.80$).

6. Results

We analyzed and selected items by exploring the factor structure and eliminating redundant items. Analyses were conducted using R (version 3.4.4; R Core Team, 2018) with the psych, lavaan, paran, and semTools packages.

6.1. Parallel analysis and simple structure

We used parallel analysis (Horn, 1965) on the initial pool of 53 items to guide the number of factors to extract. Parallel analysis generates eigenvalues (in this case, using principal axis factoring) from random datasets with parameters similar to the existing dataset (Humphreys & Montanelli, 1975). Results suggested between four and six factors fit best depending upon the data reduction strategy used to compute the factor scores. However, four factors resulted in the minimal MAP criterion (Velicer, 1976). Combined, we chose to limit the factor extraction to four factors due to parsimony and theoretical rationale.

6.2. Exploratory factor analyses

Through a series of exploratory factor analyses (principal-axis factoring), separately for the two countries, we removed items that cross-loaded on multiple factors (greater than 0.35) and/or did not load significantly on any factor (less than 0.35). This led to a final pool of 15 items.

Using both samples combined, the factor model for the final 15 items suggested a four-factor solution (explaining 51.2% of the original item variance). The labels given to the four factors in order of variance explained were: Openness to People's Ideas (5 items, e.g., “I value colleagues with different ideas.”), Stress Tolerance (5 items, e.g., “I do not shy away from the unknown or unfamiliar even if it seems scary.”), Deprivation Sensitivity (3 items, e.g., “When given a complex problem at work, I can't rest until I find the answer”), and Joyous Exploration (2 items, e.g., “I get excited thinking about experimenting with different ideas.”). Loadings ranged from 0.47 to 0.77 for Openness to People's Ideas, 0.61 to 0.73 for Stress Tolerance, 0.48 to 0.76 for Deprivation Sensitivity, and 0.27 to 0.44 for Joyous Exploration. Correlations between factors are reported in Table 2.

6.3. Predicting innovation

For the United States, innovation propensity correlated 0.44 with Deprivation Sensitivity, 0.46 with Openness to People's Ideas, 0.53 with Joyous Exploration, and 0.61 with Stress Tolerance. Similar results were found for Germany with innovation propensity correlating 0.40 with Deprivation Sensitivity, 0.44 with Openness to People's Ideas, 0.49 with Joyous Exploration, and 0.60 with Stress Tolerance. Using the total score of the M-Workplace Curiosity Scale (combining the four dimensions), there was a correlation of 0.61 and 0.60 with innovation propensity in the United States and Germany samples, respectively.

7. Discussion

The initial findings support the presence of four related, but independent, dimensions of work related curiosity. Our factor analytic results integrate previously isolated bodies of curiosity research into a single framework to understand the nature of this psychological strength in the workplace. For instance, certain theories describe curiosity as a positive emotional experience combined with an approach motivation (e.g., Sansone & Thoman, 2005), whereas others counter that curiosity elicits tension when a person attempts to reconcile gaps in information (e.g., Litman & Jimerson, 2004; Loewenstein, 1994). Our model integrates the joyous exploration, deprivation sensitivity, openness to people's ideas, and stress tolerance required to pursue the new, uncertain, complex, and ambiguous. Our work domain approach extends existing support for two-dimensional (Litman, 2005), three-dimensional (Reio et al., 2006), and five-dimensional (Kashdan et al., 2018) models.

Initial results found that each curiosity dimension was moderately to strongly correlated with the personal pursuit of innovative ideas in the workplace. However, deprivation sensitivity had a smaller link to innovation propensity whereas the dimension with the strongest link was stress tolerance (the ability to handle the psychological challenges of dealing with novelty). The correlation patterns were nearly identical in United States and German employees. Our findings add to theory and research on the importance of including stress tolerance in conceptual models and operationalizations of curiosity (e.g., Spielberger & Starr, 1994).

In Study 2, we sought to refine and finalize the M-Workplace Curiosity Scale, replicate the four-dimensional structure, and comprehensively explore the benefits of particular curiosity dimensions in the workplace. This included a conservative test of which psychological strength is the best predictor of performance and fulfillment in the workplace: curiosity or mindfulness. To date, mindfulness has received far more scientific and media attention than curiosity as a contributor to high levels of functioning and health in the workplace (e.g., Dane, 2011; Hülsheger, Alberts, Feinholdt & Lang, 2013).

8. Study 2

Our goal was to refine and finalize the M-Workplace Curiosity Scale. Two subscales from Study 1 were well-established: Openness to People's Ideas and Stress Tolerance. Two other factors (Deprivation Sensitivity and Joyous Exploration) were clearly relevant to curiosity but lacked a sufficient number of items to be psychometrically defensible (3 and 2 items, respectively). We supplemented these two scales with new items and tested our *a priori* measurement model using a confirmatory procedure. Specifically, the 15-item pool from Study 1 was supplemented with six additional items. These six items are work domain variants of items previously tested in developing general joyous exploration and deprivation sensitivity scales, influenced by literature on work environments (e.g., Amabile, Conti, Coon, Lazenby & Herron, 1996). We ended with a test of whether in fact curiosity is best understood as a hierarchical structure, with the four dimensions existing at one level and a broad, general curiosity factor at another level. We tested this with a bifactor model (e.g., Reise, Moore & Haviland, 2010). In general, "a bifactor model tests whether: (a) there is a general factor that accounts for the commonality shared by the facets, and (b) there are multiple specific factors, each of which accounts for the unique influence of the specific facet over and above the general factor" (p. 1036, Chen, Jing, Hayes & Lee, 2013). Subsequent to clarifying the structure of curiosity, we explored whether it is relevant to a comprehensive range of healthy work related outcomes, and if so, how much variance could be accounted for by particular curiosity dimensions. The specific work outcomes of interest were job satisfaction, work engagement, job crafting, the presence of healthy social relationships at work, and innovative work behaviors. As a test of construct specificity, we assessed

the unique contribution of curiosity over and above mindfulness on work-relevant benefits. This is a conservative test because mindfulness has received greater attention as a potentially valuable target in many workplaces, leading companies to promote and cultivate it (e.g., Dane, 2011; Good et al., 2015; Hülsheger et al., 2013).

9. Method

9.1. Participants

We recruited 500 working adults in the United States from Amazon's Mechanical Turk (i.e., MTurk). We also recruited 300 working adults in Germany from Clickworker (a German company specializing in mobile crowdsourcing and online surveys). A one-month follow-up was administered where the additional six items were added. After removing participants who failed to pass a careless responding check (e.g., Please select "slightly agree") or who completed the survey in less than 15 min, our final United States sample consisted of 483 participants (48.20% male, 88.2% working full-time) at baseline and 352 at a 1-month follow-up (73% retention rate). The final German sample consisted of 286 participants at baseline (55.2% male, 91.6% working full-time), and 202 at the 1-month follow-up (71% retention rate). The mean age in the United States sample was 35.63 years ($SD = 10.06$) and 35.48 years ($SD = 11.49$) in the German sample. To examine test-retest reliability of our final measure, we collected a second one-month follow up (i.e., third wave of data collection). All participants who completed the initial follow up were invited to participate. As in the prior two surveys, participants who failed careless responder checks and/or who completed the survey in less than 15 min were removed. This third sample consisted of 199 participants in the United States sample and 91 participants in the German sample. Demographic information is reported in Table 1.

9.2. Procedures

Participants were recruited through MTurk for the United States sample and Clickworker for the German sample. Participants were contacted one month after their initial survey; those who completed this survey were contacted again one month later for the second follow-up (i.e., wave three) survey. Payment for completing the baseline survey was \$4 with an additional \$4 for completing the first follow-up survey, and \$4 for completing the second follow up survey. MTurk, along with Clickworker as the German equivalent, arguably provides more generalizable participants than the typical sample of young American college students studying psychology (Buhrmester, Kwang & Gosling, 2013). The same measurement battery was given to the United States and Germany samples but in their native languages. When available, pre-existing German translations of measures were used (e.g., German Work-Related Curiosity Scale). All other measures were translated by the last author, who is fluent in German. Independent colleagues conducted back-translations to English, which the other authors reviewed, and contacted the last author about refinements to accurately reflect the wording of the original items (Beaton, Bombardier, Guillemin & Ferraz, 2000). This process occurred multiple times until the back-translations were sufficiently similar to their original English versions. Data from the baseline wave of data collection were not used in the current paper; see the Results section for details.

9.3. Measures

In addition to the initial 15 M-Workplace Curiosity Scale items, participants completed three new Joyous Exploration items (i.e., *At work, I seek out opportunities to expand my knowledge or skills*"; *I seek out work tasks where I will have to think in depth about something*"; and *I enjoy being exposed to ideas and perspectives that are unfamiliar to me*) and

Deprivation Sensitivity items (i.e., *When off duty, I still think about solutions to difficult work related problems; I can spend hours on a single problem because of a need to find an answer*; and *I work relentlessly to find answers to complicated questions at work*).

Participants completed the 10-item German Work-Related Curiosity Scale (Mussel et al., 2012). This single-dimension scale reflects behavioral tendencies to seek information, acquire knowledge, learn, and think at the workplace (e.g., *I am interested in how my contribution impacts the company*). Participants responded to items on a 7-point Likert scale from 0 = *totally disagree* to 6 = *totally agree*. Reliability was acceptable in the present study (United States $\alpha = 0.94$; German $\alpha = 0.92$).

The Mindful Attention Awareness Scale (Brown & Ryan, 2003) assessed trait mindfulness (15 items; e.g., *I find myself doing things without paying attention*). Responses were made on a 6-point scale from 1 = *almost always* to 6 = *almost never*; higher scores reflected higher mindfulness. Construct validity has been shown with evidence that scores increase in response to mindfulness interventions (Cavanagh, Strauss, Forder & Jones, 2014). Reliability was acceptable (United States $\alpha = 0.94$; German $\alpha = 0.89$).

Participants completed a 5-item face-valid Job Satisfaction subscale to rate the extent to which, at work, they feel fulfilled (Repetti, 1987). Sample items included *Generally speaking, I am very satisfied with this job* and *I frequently think of quitting this job* (reverse scored). Participants responded on a 7-point Likert scale from 1 = *strongly disagree* to 7 = *strongly agree*. Reliability was acceptable (United States $\alpha = 0.85$; German $\alpha = 0.85$).

Participants completed the 9-item short-version of the Utrecht Work Engagement Scale (Schaufeli, Bakker & Salanova, 2006), with three 3-item subscales capturing work related vigor (e.g., *At my work, I feel strong and vigorous*), dedication (e.g., *I am proud of the work I do*), and absorption (e.g., *I am immersed in my work*). Participants responded on a 7-point Likert scale from 1 = *never* to 7 = *always/every day*. Construct validity has been shown with evidence that higher scores are related to an increase in life satisfaction, physical and mental health, and job performance over a 2-year interval (Shimazu, Schaufeli, Kamiyama & Kawakami, 2015). Reliability was acceptable for the vigor, dedication, and absorption subscales, respectively (United States $\alpha = 0.89, 0.91, \text{ and } 0.86$; German $\alpha = 0.87, 0.90, \text{ and } 0.87$).

Participants completed the 16-item Oldenburg Burnout Inventory (Demerouti, Bakker, Nachreiner & Schaufeli, 2001), with 8-item Disengagement (e.g., *It happens more and more often that I talk about my work in a negative way*) and Exhaustion (e.g., *After my work, I usually feel worn out and weary*) subscales. Participants responded on a 4-point Likert scale from 0 = *strongly disagree* to 3 = *strongly agree*. Construct validity has been shown with evidence that people who stay versus leave their work organization can be differentiated by burnout scores, and evidence that higher scores at baseline predicted a greater sense of autonomy at work and support from colleagues and supervisors (e.g., De Lange, De Witte & Notelaers, 2008). Reliability was acceptable for the disengagement and exhaustion subscales, respectively (United States $\alpha = 0.81 \text{ and } 0.82$; German $\alpha = 0.76 \text{ and } 0.82$).

Participants completed the 10-item Job Crafting Measure (Petrou, Demerouti, Peeters, Schaufeli & Hetland, 2012). They indicated how often at work over the past three months they took advantage of opportunities to make subtle changes in work tasks to increase enjoyment, connect with more people, or view the job in a new way to make it more purposeful. We limited our focus to the 4-item seeking resources (e.g., *I ask others for feedback on my job performance*) and 3-item seeking challenges (e.g., *I ask for more tasks if I finish my work*) subscales. Participants responded on a 5-point Likert scale from 1 = *never* to 5 = *often*. Reliability was acceptable for the seeking resources and challenges subscales, respectively (United States $\alpha = 0.81 \text{ and } 0.90$; German $\alpha = 0.75 \text{ and } 0.76$).

Participants completed the 4-item Supervisor/Co-worker support subscale of the Social Environment at Work Scale (Repetti, 1987) to rate

the extent that, at work, people feel other people are trustworthy and helpful (e.g., *How much can your immediate supervisor/other people at work be relied on when things get tough at work?*). Participants responded on a 7-point Likert scale from 1 = *strongly disagree* to 7 = *strongly agree*. Reliability was acceptable (United States $\alpha = 0.82$; German $\alpha = 0.69$).

Participants completed the 6-item Innovative Behavior Scale (Scott & Bruce, 1994, modified by Rosing & Zacher, 2017) to rate the extent to which, at work, they exhibited behaviors involving innovation (e.g., *This month, at work I promoted and championed ideas to others*). Participants responded on a 7-point Likert scale from 1 = *strongly disagree* to 7 = *strongly agree*. Reliability was acceptable (United States $\alpha = 0.92$; German $\alpha = 0.93$).

10. Results

We collected the baseline wave of data while data from Study 1 were being cleaned. Therefore, the new items were not included at baseline. We included the six new items in the follow-up wave. All analyses reported for Study 2 in the text and tables are limited to participants from the follow-up wave (other results are available upon request).¹ Our aim with the United States and German employee samples was to a) refine the instrument based upon the additional items, and b) conduct a comprehensive examination of the link between workplace curiosity and functioning.

10.1. Measure evaluation

Participants responded to the 15 original items (from Study 1) and six additional items as noted previously. We winnowed the pool of 21 items to 16 with four items per subscale as a function of theoretical consistency, item quality, and face validity. The resulting 16-item measure was assessed using a multi-group confirmatory factor analysis (CFA) to evaluate the invariance of the measurement model across the two country samples.

10.2. Factor structure

The associations among the final 16 items were examined via confirmatory factor analysis with the measurement invariance function in the semTools R package. We evaluated measurement invariance based upon three standards: “weak” invariance where only the factor loadings are assumed to be equal between the two groups, “strong” invariance where both the factor loadings and intercepts are assumed equal, and “strict” invariance where factor loadings, intercepts, and residuals are all assumed equal. Invariance estimates are based upon a model comparison among those restrictive assumptions and the more relaxed configural invariance model whereby only the same factor structure is assumed across samples. Based on results from Study 1, we anticipated a four-factor solution with four items per factor.

To evaluate model specification, the chi-square value (χ^2), comparative fit index (CFI), and root mean square error of approximation (RMSEA), were used to assess model fit. The measurement invariance tests indicated that the “weak” invariance model, while significantly different in terms of the chi-square, yielded a trivial change in the comparative fit index (i.e., CFI change < 0.01 where CFI for the configural model was 0.934 and the CFI for the weak invariance model was

¹ We examined correlations between the initial survey at baseline and the final survey at the 1-month follow-up for each dimension. Temporal stability results were within the range of stable personality traits for the United States sample: Joyous Exploration (.57), Deprivation Sensitivity (.53), Stress Tolerance (.63), and Openness to People's Ideas (.65); similar findings were found for the German sample: Joyous Exploration (.65), Deprivation Sensitivity (.51), Stress Tolerance (.70), and Openness to People's Ideas (.56). Other results reported for Study 2 are limited to the participants who completed the follow-up assessment.

Table 3
Confirmatory Factor Analysis Loadings of the M-Workplace Curiosity Scale (Study 2).

Item	United States	Germany
Joyous Exploration		
I enjoy that I often find my mind continues to work through complex problems outside of work	.64	.69
I get excited thinking about experimenting with different ideas	.78	.73
At work, I seek out opportunities to expand my knowledge or skills	.71	.80
I seek out work tasks where I will have to think in depth about something	.80	.81
Deprivation Sensitivity		
When given a complex problem at work, I can't rest until I find the answer	.66	.63
When a complex work problem arises, I continue to seek information until I understand it fully.	.67	.66
I can spend hours on a single problem because I feel a need to find an answer	.81	.77
I work relentlessly to find answers to complicated questions at work	.85	.80
Stress Tolerance		
When work is anxiety provoking, I tend to explore rather than avoid	.71	.68
The possibility of being distressed does not impact my motivation to work on new projects	.82	.68
I do not shy away from the unknown or unfamiliar even if it seems scary	.86	.81
When probing deeper into a project that interests me, feeling anxious does not derail me	.85	.77
Openness to People's Ideas		
It is important to listen to ideas from people who think differently	.75	.79
I value colleagues with different ideas	.81	.86
I like to hear ideas from colleagues even if they are different from my current line of thinking	.89	.82
Even when I am confident in my approach to a problem, I like to hear other people's opinions	.86	.80

0.931; Cheung & Rensvold, 2002). Based upon these results, we concluded that the four factor solution fit both samples and that the factor loadings were largely replicated. The fit statistics for the multisample CFA were as follows: $\chi^2 = 469.94$, $df = 208$, $p < 0.001$, CFI = 0.93, GFI = 0.97, and RMSEA = 0.07.

The item-level factor analytic results are reported in Table 3. The CFA results for each sample indicated strong standardized factor loadings: Joyous Exploration loadings ranged from 0.64 to 0.81, Deprivation Sensitivity loadings ranged from 0.63 to 0.85, Openness to People's Ideas loadings ranged from 0.75 to 0.89, and Stress Tolerance loadings ranged from 0.68 to 0.89.

In addition to the correlated factor CFA, we also tested a bifactor CFA to determine whether curiosity is best understood as possessing a common, general factor along with underlying dimensions. Evidence for this structure would support the utility of a total score. A bifactor model was justified by theory and the large correlations between the four factors. Arguably, the presence of a bifactor structure is supported if the global factor accounts at least half of the variance in the measurement scale (Reise et al., 2010). A bifactor model, with a general curiosity factor and four second-order dimensions, fit the data well: RMSEA = 0.067, communalities ranging from 0.44 to 0.70, and the common variance explained by the general curiosity factor was 52% ($\Omega = 0.94$). Given the results from the invariance test, the moderate fit from the multisample CFA, the relatively good fit for the bifactor model, and the large amount of variance accounted for by the general curiosity factor, we concluded that the best fitting and most theoretically defensible model consisted of four factors with a general (g) factor. These results support a hierarchical structure model of curiosity, and the use of either a total score or four separate subscale scores.

10.3. Associations with existing curiosity and mindfulness scales

The second component of Study 2 focused on convergent, discriminant, and construct validity. Measures of related constructs were used to understand the nomological network of the four dimensions of curiosity. As shown in Table 4, for the United States, our four dimensions accounted for 66% of the variance in the German Work Related Curiosity Scale. In terms of correlations, each dimension correlated between 0.60 (Openness to People's Ideas) and 0.67 (Deprivation Sensitivity) with the German Work Related Curiosity Scale. Similar findings were found for Germany with the four dimensions accounting for 60% of the variance; correlations ranged from 0.42 (Deprivation Sensitivity)

to 0.68 (Joyous Exploration) (Table 5).

In terms of discriminant validity, for the United States, our four dimensions accounted for only 6% of the variance in trait mindfulness. Similar findings were found for Germany with the four dimensions accounting for only 5% of the variance (Table 5). Mindfulness and curiosity might both be positive characteristics but there appears to be a weak association between being curious at work and being a person who is generally mindful in day-to-day life.

10.4. Associations with work related outcomes

For employees in the United States, Joyous Exploration had correlations above 0.25 with each dimension of work engagement (vigor, dedication, absorption), seeking resources to make job tasks more meaningful (job crafting), and innovative behaviors, as well as an inverse relationship with burnout (exhaustion) (Table 4). Deprivation Sensitivity had correlations above 0.25 with dedication and absorption (reflecting work engagement), each dimension of job crafting (seeking challenges and resources), and innovative behaviors. Stress Tolerance and Openness to People's Ideas had correlations between 0.26 and 0.50 with every index of healthy work functioning.

For employees in Germany, Joyous Exploration had stronger correlations with indices of healthy work functioning, with correlations between 0.32 and 0.52 with every index of healthy work functioning except for social support (correlating at 0.16) (Table 5). Deprivation Sensitivity had correlations above 0.25 with each dimension of work engagement (vigor, dedication, absorption) and innovative behaviors. Stress Tolerance and Openness to People's Ideas had correlations between 0.25 and 0.55 with every index of healthy work functioning, with the exception of stress tolerance correlating 0.22 with work social support.

Effect sizes tended to be larger when using the total score of the M-Workplace Curiosity Scale. Correlations in Germany were 0.77, $p < 0.001$, with the German work-related curiosity scale, -0.19 , $p < 0.05$, with trait mindfulness, 0.42, $p < 0.001$, with job satisfaction, 0.61, $p < 0.001$, with work environment-vigor, 0.60, $p < 0.001$, with work environment-engagement, 0.54, $p < 0.001$, with work environment-absorption, -0.47 , $p < 0.001$, with burnout – disengagement, -0.44 , $p < 0.001$, with burnout – exhaustion, 0.42, $p < 0.001$, with job crafting – resources, 0.41, $p < 0.001$, with job crafting – challenges, 0.24, $p < 0.005$, with work social support, and 0.53, $p < 0.001$, with innovative behaviors.

Table 4
Construct Validity of the M-Workplace Curiosity Scale Dimensions with the United States sample (Study 2).

Outcome	Full Model R ²	Joyous Exploration			Deprivation Sensitivity			Stress Tolerance			Openness to People's Ideas		
		β	t	r (pr)	β	t	r (pr)	β	t	r (pr)	β	t	r (pr)
German work curiosity	.66*	.22*	4.18*	.65 (0.25)	.33*	7.50*	.65 (0.25)	.23*	5.05*	.62 (0.29)	.27*	6.56*	.62 (0.29)
Trait mindfulness	.06*	.08	.92	.08 (0.06)	.05	.74	.08 (0.06)	.18*	2.34*	.18 (0.14)	.18*	2.57*	.18 (0.14)
Job satisfaction	.15*	−0.09	−1.13	.20 (0.03)	.04	.55	.20 (0.03)	.28*	3.82*	.33 (0.23)	.21*	3.23*	.33 (0.23)
Work Engagement- vigor	.24*	.04	.60	.32 (0.04)	−0.06	−0.94	.32 (0.04)	.39*	5.63*	.46 (0.32)	.19*	2.99*	.46 (0.32)
Work Engagement - dedication	.21*	.02	.28	.31 (0.02)	.05	.72	.31 (0.02)	.27*	3.86*	.40 (0.23)	.22*	3.56*	.40 (0.23)
Work Engagement - absorption	0.18*	.01	.07	.29 (0.00)	.08	1.15	.29 (0.00)	.24*	3.38*	.37 (0.20)	.20*	3.17*	.37 (0.20)
Burnout - disengagement	.14*	−0.01	−0.08	−0.24 (0.01)	−0.02	−0.28	−0.24 (0.01)	−0.27*	−3.65*	−0.34 (−0.22)	−0.17*	−2.51*	−0.34 (−0.22)
Burnout - exhaustion	.20*	−0.03	−0.36	−0.25 (0.02)	−0.06	−0.86	−0.25 (0.02)	−0.42*	−5.96*	−0.43 (−0.34)	−0.13*	−2.06*	−0.43 (−0.34)
Job crafting - resources	.22*	.16*	2.13*	.35 (0.13)	.09	1.30	.35 (0.13)	−0.02	−0.23	.26 (−0.01)	.33*	5.30*	.26 (−0.01)
Job crafting - challenges	.11*	−0.05	−0.58	.20 (−0.04)	.19*	2.61*	.20 (−0.04)	.17*	2.26*	.26 (0.14)	.09	1.30	.26 (0.14)
Work social support	.17*	−0.01	−0.15	.21 (−0.01)	−0.06	−0.81	.21 (−0.01)	.16*	2.21*	.27 (0.13)	.35*	5.41*	.27 (0.13)
Innovative behaviors	.28*	.11	1.46	.40 (0.09)	.04	.68	.40 (0.09)	.37*	5.59*	.50 (0.32)	.11	1.89	.50 (0.32)

Note. Results are from a regression model for each outcome with the four curiosity dimensions as simultaneous predictors in a single step. * = standardized beta coefficients significant at 0.05 level.

Table 5
Construct validity of the M-Workplace Curiosity Scale Dimensions with the German sample (Study 2).

Outcome	Full Model R ²	Joyous Exploration			Deprivation Sensitivity			Stress Tolerance			Openness to People's Ideas		
		β	t	r (pr)	β	t	r (pr)	β	t	r (pr)	β	t	r (pr)
German work curiosity	.60*	.44*	6.50*	.68 (0.48)	.15*	2.62*	.42 (0.22)	.23*	3.27*	.62 (0.27)	.21*	3.67*	.45 (0.30)
Trait mindfulness	.05*	.03	.32	.15 (0.03)	−0.00	.01	.08 (0.00)	.20	1.83	.22 (0.15)	.00	.01	0.09 (0.00)
Job satisfaction	.18*	.13	1.31	.32 (0.11)	.09	1.12	.24 (0.09)	.22*	2.20*	.37 (0.18)	.13	1.52	.27 (0.13)
Work Engagement- vigor	.39*	.27*	3.20*	.51 (0.26)	.03	.43	.27 (0.04)	.30*	3.54*	.55 (0.29)	.21*	2.85*	.40 (0.23)
Work Engagement - dedication	.38*	.30*	3.61*	.52 (0.29)	.04	.57	.27 (0.05)	.26*	2.98*	.53 (0.24)	.20*	2.70*	.39 (0.22)
Work Engagement - absorption	0.31*	.29*	3.25*	.48 (0.26)	.04	.58	.25 (0.05)	.25*	2.75*	.48 (0.23)	.12	1.51	.30 (0.13)
Burnout - disengagement	.22*	−0.18	−1.93	−0.39 (−0.16)	−0.08	−1.01	−0.25 (−0.09)	−0.25*	−2.58*	−0.42 (−0.21)	−0.10	−1.26	−0.27 (−0.11)
Burnout - exhaustion	.21*	−0.13	−1.41	−0.34 (−0.12)	−0.03	−0.31	−0.19 (−0.03)	−0.27*	−2.72*	−0.42 (−0.22)	−0.16*	−1.99*	−0.31 (−0.17)
Job crafting - resources	.18*	.24*	2.54*	.38 (0.21)	.04	.47	.20 (0.04)	.14	1.42	.35 (0.12)	.13	1.57	.26 (0.13)
Job crafting - challenges	.20*	.17	1.79	.34 (0.15)	−0.04	−0.49	.13 (−0.04)	.24*	2.43*	.39 (0.20)	.17*	2.05*	.30 (0.17)
Work social support	.08*	.05	.46	.16 (0.04)	−0.05	−0.60	.05 (−0.05)	.13	1.24	.22 (0.10)	.20*	2.24*	.25 (0.19)
Innovative behaviors	.29*	.27*	2.98*	.46 (0.24)	.10	1.26	.29 (0.11)	.22*	2.33*	.45 (0.19)	.12	1.58	.30 (0.13)

Note. Results are from a regression model for each outcome with the four curiosity dimensions as simultaneous predictors in a single step. * = standardized beta coefficients significant at 0.05 level.

10.5. Construct specificity

We conducted construct specificity analyses to determine whether the workplace curiosity dimensions and the overarching general factor of the M-Workplace Curiosity Scale predicted work outcomes over and above the variance attributed to trait mindfulness. First, we used two-step hierarchical multiple regressions in which trait mindfulness was entered in the first step and the total score of the M-Workplace Curiosity Scale was entered in the second step. Because work related curiosity represents the only change between steps, any added prediction can be attributed to the M-Workplace Curiosity Scale (Hunsley & Meyer, 2003). Second, we entered the four workplace curiosity dimensions instead of the total score in the second step.

Table 6 shows the results of the regression equations for United States employees. In predicting each index of healthy work functioning, the total score of the M-Workplace Curiosity Scale accounted for 8% (job satisfaction) to 25% (innovative behaviors) additional variance above and beyond the variance attributed to trait mindfulness, which ranged from 0% (for each job crafting dimension) to 20% (exhaustion dimension of workplace burnout). Similar variance is explained when simultaneously entering the four workplace curiosity dimensions. Notably, when competing for variance, the curiosity dimensions that show

the largest, consistent effects on healthy workplace functioning were stress tolerance and openness to people's ideas.

In Table 7, with German employees, we found similar results. In predicting each index of healthy work functioning, the total score of the M-Workplace Curiosity Scale accounted for 4% (social support) to 32% (vigor dimension of workplace engagement) additional variance above and beyond the variance attributed to trait mindfulness, which ranged from 0% (for each job crafting dimension) to 25% (exhaustion dimension of workplace burnout). Similar variance is explained when simultaneously entering the four workplace curiosity dimensions. Notably, when competing for variance, three of the curiosity dimensions showed large, consistent effects on healthy workplace functioning: stress tolerance, openness to people's ideas, and joyous exploration.

Results offer empirical support for work related curiosity outperforming trait mindfulness in understanding every adaptive element in the workplace (see the partial correlations in Tables 6 and 7). Trait mindfulness outperformed work related curiosity in predicting the only maladaptive outcomes under study: burnout as defined by disengagement and exhaustion.

Table 6
Testing Whether the M-Workplace Curiosity Scale Predicts Outcomes Beyond Trait Mindfulness in the United States (Study 2).

Outcome	Model		Step One: Trait Mindfulness				Step Two: M-Workplace Curiosity total score							
	R ²	R ² ch	β	t	r (pr)	R ² ch	β	t	r (pr)					
German work curiosity	.65*	.03*	.17*	2.88*	.17 (0.17)	.65*	.80*	22.12*	.81 (0.80)					
Job satisfaction	.16*	.08*	.28*	4.77*	.28 (0.28)	.08*	.29*	5.15*	.33 (0.29)					
Engagement-vigor	.20*	.04*	.21*	3.55*	.21 (0.21)	.16*	.41*	7.45*	.43 (0.41)					
Engagement-dedication	.21*	.06*	.24*	4.01*	.24 (0.24)	.16*	.40*	7.41*	.43 (0.41)					
Engagement-absorption	0.17*	.02*	.15*	2.52*	.15 (0.15)	.15*	.39*	6.94*	.40 (0.39)					
Burnout - disengagement	.24*	0.17*	−0.41*	−7.44*	−0.41 (−0.41)	.08*	−0.28*	−5.28*	−0.34 (−0.30)					
Burnout - exhaustion	.28*	.20*	−0.45*	−8.29*	−0.45 (−0.45)	.09*	−0.30*	−5.73*	−0.36 (−0.33)					
Job crafting - resources	.18*	.00	−0.02	−0.28	−0.02 (−0.02)	.19*	.44*	7.89*	.42 (0.43)					
Job crafting - challenges	.10*	.00	−0.01	−0.24	−0.01 (−0.01)	.10*	.31*	5.35*	.30 (0.31)					
Work social support	.11*	.02*	.13*	2.18*	.13 (0.13)	.09*	.31*	5.32*	.32 (0.31)					
Innovative behaviors	.26*	.00	.04	.63	.04 (0.04)	.25*	.51*	9.64*	.50 (0.50)					
Outcome	Step 1 R ²	Step 2 R ² ch	Joyous Exploration			Deprivation Sensitivity			Stress Tolerance			Openness to People's Ideas		
			β	t	pr	β	t	pr	β	t	pr	β	t	pr
German work curiosity	.03*	.63*	.05*	4.22*	.25	.33*	7.54*	.42	.23*	4.88*	.29	.26*	6.31*	.36
Job satisfaction	.08*	.11*	−0.08	−1.00	−0.06	.05	.71	.04	.24*	3.41*	.20	.18*	2.72*	.16
Engagement-vigor	.04*	.21*	.05	.66	.04	−0.06	−0.87	.04	.37*	5.40*	.31	.17*	2.67*	.16
Engagement-dedication	.06*	.18*	.03	.41	0.03	.06	.84	.05	.25*	3.52*	.21	.20*	3.15*	.19
Engagement-absorption	0.02*	0.16*	.01	0.09	.01	.08	1.19	.07	.23*	3.25*	.19	.19*	2.96*	.18
Burnout - disengagement	.17*	.09*	−0.02	−0.28	.02	−0.04	−0.59	−0.04	−0.20*	−2.97*	−0.18	−0.10	−1.66	−0.18
Burnout - exhaustion	.20*	.13*	.00	.06	0.00	−0.04	−0.63	−0.04	−0.36*	−5.50*	−0.32	−0.07	−1.11	−0.07
Job crafting - resources	.00	.23*	.15*	2.05*	0.12	.08	1.23	.07	.00	.99	.00	.35*	5.55*	.32
Job crafting - challenges	.00	.11*	−0.06	−0.68	−0.04	.18*	2.55*	.15	.18*	2.46*	.15	.10	1.49	.09
Work social support	.02*	.15*	−0.01	−0.07	0.12	−0.05	−0.77	−0.05	.15*	2.04*	.12	.34*	5.22*	.30
Innovative behaviors	.00	.28*	.10	1.37	0.08	.04	.62	.04	.39*	5.75*	.33	.13*	2.06*	.13

Notes. Results are from a series of hierarchical regression models with trait mindfulness at Step One. In the top panel, the M-Workplace Curiosity total score is entered at Step Two. In the bottom panel, work related curiosity dimensions are entered at Step Two. * = standardized beta coefficients significant at 0.05 level.

Table 7
Testing Whether the M-Workplace Curiosity Scale Predicts Outcomes Beyond Trait Mindfulness in the German Sample (Study 2).

Outcome	Full Model		Step One: Trait Mindfulness				Step Two: M-Workplace Curiosity total score							
	R ²	R ² ch	β	t	r (pr)	R ² ch	β	t	r (pr)					
German work curiosity	.60*	.06*	.24*	3.01*	.24 (0.24)	.54*	.75*	13.75*	.77 (0.76)					
Job satisfaction	.25*	.12*	.34*	4.37*	.34 (0.34)	.13*	.37*	4.95*	.42 (0.38)					
Work Engagement- vigor	.40*	.09*	.30*	3.72*	.30 (0.30)	.32*	.57*	8.72*	.61 (0.59)					
Work Engagement - dedication	.39*	.08*	.29*	3.57*	.29 (0.29)	.31*	.57*	8.55*	.60 (0.58)					
Work Engagement - absorption	0.32*	.08*	.28*	3.49*	.28 (0.28)	.24*	.50*	7.16*	.54 (0.51)					
Burnout - disengagement	.34*	0.19*	−0.44*	−5.84*	−0.44 (−0.44)	.15*	−0.40*	−5.75*	−0.47 (−0.43)					
Burnout - exhaustion	.38*	.25*	−0.50*	−6.93*	−0.50 (−0.50)	.13*	−0.36*	−5.35*	−0.44 (−0.41)					
Job crafting - resources	.18*	.00	−0.04	−0.50	−0.04 (−0.04)	.17*	.43*	5.50*	.42 (0.42)					
Job crafting - challenges	.17*	.00	−0.03	−0.33	−0.03 (−0.03)	.17*	.42*	5.46*	.41 (0.42)					
Work social support	.07*	.03*	.18*	2.20*	.18 (0.18)	.04*	.21*	2.54*	.24 (0.21)					
Innovative behaviors	.30*	.05*	.22*	2.76*	.22 (0.22)	.25*	.51*	7.08*	.53 (0.51)					
Outcome	Step 1 R ²	Step 2 R ² ch	Joyous Exploration			Deprivation Sensitivity			Stress Tolerance			Openness to People's Ideas		
			β	t	pr	β	t	pr	β	t	pr	β	t	pr
German work curiosity	.06*	.55*	.43*	6.51*	.48	.15*	2.64*	.22	.21*	2.97*	.24	.21*	3.70*	.30
Job satisfaction	.12*	.13*	.12	1.26	0.11	.09	1.16	.10	.17	1.72	.14	.13	1.58	.13
Engagement-vigor	.09*	.34*	.26*	3.20*	.26	.03	.44	.04	.27*	3.17*	.26	.20*	2.92*	.24
Engagement-dedication	.08*	.33*	.30*	3.61*	0.29	.04	.58	.22	.22*	2.61*	.22	.20*	2.76*	.23
Engagement-absorption	0.08*	0.26*	.28*	3.24*	.26	.04	0.58	.05	.22*	2.39*	.20	.12	1.53	.13
Burnout - disengagement	.19*	.15*	−0.17	−1.96	−0.16	−0.08	−1.09	−0.09	−0.18*	−1.99*	−0.17	−0.10	−1.36	−0.11
Burnout - exhaustion	.25*	.14*	−0.12	−1.43	−0.12	−0.02	−0.34	−0.03	−0.18*	−2.07*	−0.17	−0.16*	−2.24*	−0.19
Job crafting - resources	.00	.18*	.25*	2.55*	0.21	.04	.47	.04	.15	1.49	.13	.13	1.57	.13
Job crafting - challenges	.00	.20*	.17	1.81	0.15	−0.04	−0.49	−0.04	.25*	2.53*	.21	.17*	2.05*	.17
Work social support	.03*	.07*	.04	.41	0.04	−0.05	−0.60	−0.05	.10	.98	.08	.20*	2.25*	.19
Innovative behaviors	.05*	.25*	.26*	2.95*	0.24	.10	1.27	.11	.19*	2.06*	.17	.12	1.59	.13

Notes. Results are from a series of hierarchical regression models with trait mindfulness at Step One. In the top panel, the M-Workplace Curiosity total score is entered at Step Two. In the bottom panel, work related curiosity dimensions are entered at Step Two. * = standardized beta coefficients significant at 0.05 level.

10.6. Test-retest reliability

We examined test-retest reliability of our new measure by examining bivariate correlations between each subscale at waves two and three. Results suggest acceptable test-retest reliability for all subscales in both samples. For the United States sample, test-retest values were 0.75 for Joyous Exploration, 0.70 for Deprivation Sensitivity, 0.71 for Stress Tolerance, and 0.65 for Openness to People's Ideas. For the German sample, test-retest values were 0.57 for Joyous Exploration,

0.60 for Deprivation Sensitivity, 0.61 for Stress Tolerance, and 0.68 for Openness to People's Ideas. Using the total score of the M-Workplace Curiosity Scale (combining the four dimensions), the test-retest reliability was 0.66 and 0.75 in the United States and Germany samples, respectively.

11. Discussion

Strong convergence with existing curiosity related scales provides

evidence that each dimension of the M-Workplace Curiosity Scale measures the intended constructs. The variation in correlations between each dimension and other constructs justify the value of a multi-faceted conceptualization of curiosity in the workplace. The results in the current set of studies, in the United States and Germany, offer nuances to prior work by showing that Stress Tolerance and Openness to People's Ideas appear to be the curiosity dimensions most relevant to workplace satisfaction, engagement, social relationships, and performance. In support of cross-cultural generalizability, employees in both the United States and Germany showed similar benefits of being highly curious in the workplace.

Each of the four dimensions enable the psychological benefits of experiencing intrigue and taking the steps to explore and discover at work. People who scored high on Stress Tolerance and Openness to People's Ideas in the United States and Germany endorsed well-being at work and a high frequency of innovative behaviors. Joyous Exploration was uniquely predictive of these outcomes in Germany, but not the United States. Compared with other dimensions, Deprivation Sensitivity (seeking information to escape the tension of not knowing something) demonstrated some of the weakest associations with workplace outcomes in both countries. This is interesting because this dimension is at the core of the only existing measure of work curiosity (Mussel, 2010). Perhaps the benefits of deprivation sensitivity will emerge in the presence of epistemic goals, where acquisition of information is required for the completion of tasks. Scenario-based measures, behavioral tasks, supervisor and co-worker ratings, and the assessment of momentary experiences over the course of a workday might elicit curiosity benefits that the existing battery of outcomes did not capture.

Findings for work related curiosity failed to be subsumed by the more widely studied construct of mindfulness; a conservative test of construct specificity (because both curiosity and mindfulness involve the ability to direct and sustain attention; Bishop et al., 2004). To our knowledge, this is the first direct comparison of curiosity and mindfulness in predicting adaptive and maladaptive outcomes, and the most comprehensive examination of work outcomes linked to curiosity (Celik, Storme, Davila & Myszkowski, 2016; Mussel, 2013; Reio & Wiswell, 2000). Existing findings suggest that curiosity should prove a fertile area for understanding individual, team, and organizational behavior independent of other psychological strengths.

In sum, the factor analytic results, convergent validity with existing curiosity scales, test-retest reliability, and predictive validity of various measures of workplace well-being and performance, establishes support for a reliable and valid multidimensional measure of work related curiosity. Tests of construct specificity for various work outcomes suggest that curiosity offers substantial unique value in understanding positive approaches to organizational behavior beyond what is accounted for by trait mindfulness.

12. General discussion

For most adults, the majority of their hours will be spent working, whether it is childcare, entrepreneurship, or the income provision from an employer. The centrality of work to well-being is unsurprising—a regular source of meaning, a sense of purpose, an added feature to one's identity, the presence of frequent social interactions and potential friendships, opportunities to deploy and develop strengths, and an outlet to satisfy basic psychological needs for belonging, competence, and autonomy. To understand what contributes to well-being and healthy functioning at work, high quality assessments are required. To this end, we introduced a research program with four samples (two from the United States and two from Germany) on the relevance of curiosity to the workplace.

Based on existing theory and research (Litman, 2005; Loewenstein, 1994; Reio et al., 2006; Silvia, 2008), we created and validated a new measure that illustrates related but distinct components of experiencing and expressing curiosity when working. These

differences reflect why people are motivated to seek out new information and experiences, consider a diversity of perspectives, and orient attention and energy to explore the world.

12.1. Work related curiosity dimensions

Across two studies, we determined that a broad, overarching curiosity dimension with four lower-order facets is a valid way to understand the structure of curiosity in the workplace. Employees high on Joyous Exploration reported feeling enthusiastic, strong and vigorous. They were deeply immersed in tasks (what might be called, flow states; Csikszentmihalyi & LeFevre, 1989), regularly generated and implemented creative ideas (what might be called innovative propensity; Dobni, 2008), and proactively altered tasks by acquiring the resources necessary to derive frequent positive experiences, meaning, and learning opportunities (what might be called job crafting; Wrzesniewski & Dutton, 2001). As the archetype of curiosity that enables rewards for seeking out novelty (Maslow, 1943), this dimension is captured by the majority of self-report assessment approaches (Mussel et al., 2012; Naylor, 1981; Peterson & Seligman, 2004). This dimension had the second largest positive associations with indices of innovation propensity (for United States and German employees) and a sense of enthusiasm, vigor, dedication, and task absorption (for German employees). Taking joy in seeking out information and experiences beyond what is required appears to fuel divergent thinking, the production of creative ideas and products, and the stamina and adaptability to acquire resources that transform ideas into action (Celik et al., 2016; Harrison, 2012).

In contrast to Joyous Exploration, high scores on Deprivation Sensitivity had the smallest link to innovation (across all four samples). Employees scoring high on Deprivation Sensitivity are motivated to explore in response to unresolved problems or puzzles. Instead of desiring the difference, divergence, and deviance that is part of the creative process, high scorers on Deprivation Sensitivity seek to reduce uncertainty and increase their sense of competence (e.g., Litman, 2005; Loewenstein, 1994). This variant of curiosity, which is fraught with the discomfort of not knowing and the urge to get rid of this discomfort by closing knowledge gaps, is not as widely discussed by scientists and practitioners (e.g., Litman & Jimerson, 2004; Litman & Spielberger, 2003). On a superficial level, a person high in Deprivation Sensitivity could appear neurotic and perfectionistic instead of curious. In this research program, Deprivation Sensitivity had the largest positive association with the self-initiated modification of job tasks. This makes sense as proactively seeking demanding tasks at work is an effective strategy to develop work related knowledge and skills that in turn, make it easier to solve difficult problems and make progress toward ambitious goals (e.g., Gagné & Deci, 2005; LePine, Podsakoff & LePine, 2005).

To our knowledge, our research program is the first attempt to measure a person's Stress Tolerance at work: perceived potential to cope with the stress and strain of confronting new, volatile, uncertain, complex, and ambiguous information, tasks, and situations. Stress Tolerance has the strongest correlations with innovation (in 3 of 4 samples), job satisfaction, each element of work engagement (vigor, dedication, and task absorption), and each element of work burnout (inverse associations with disengagement and exhaustion). The unique variance attributable to Stress Tolerance upon controlling for the other curiosity dimensions in both United States and German employees was impressive (see Tables 4 and 5). Being able to handle the doubt, confusion, and anxiety when exploring is inherently important in the workplace, where the pace of change is only picking up speed (e.g., Bennett & Lemoine, 2014). Our findings converge with existing work that raises questions about measuring curiosity without any consideration of Stress Tolerance. Prior work has shown that in determining whether people are interested in and explore novel stimuli, two judgments are made: the degree to which the object of attention is

novel and the degree to which this novelty can be coped with or handled (e.g., Silvia, 2005, 2008; Turner & Silvia, 2006). The construct of curiosity will be inadequately captured as long as researchers and practitioners ignore the curiosity dimension of Stress Tolerance.

The final dimension of our model is Openness to People's Ideas, a workplace specific variant of social curiosity (e.g., Renner, 2006) wherein there is an appreciation and proactive search for useful ideas, regardless of their originator. The willingness and even preference to acquire ideas from other people, assimilate them, and apply them is an interpersonal variant of curiosity. A need to feel valued, cared for, and understood may be universal (Baumeister & Leary, 1995), whereas the desire to seek out diverse individuals as a source of new information is highly variable in the population. This manifestation of curiosity offers a competitive advantage in the workplace, as being open to cognitive diversity is an inefficient albeit effective strategy for knowledge creation (e.g., Jetten & Hornsey, 2014; Mannix & Neale, 2005; Van Knippenberg & Schippers, 2007). High scores on Openness to People's Ideas along with Stress Tolerance were consistently the two strongest predictors of healthy work related outcomes. Correlations were 0.30 or greater in predicting job satisfaction, work engagement (vigor, dedication, task absorption), job crafting to acquire resources for more meaningful work, social support, and innovative propensity (for the United States and German employees, correlations with job crafting and social support were 0.26 and 0.25, respectively). These findings provide initial support for this particular dimension of curiosity in understanding well-being and healthy work functioning.

12.2. Research and practice implications

When psychological strengths such as curiosity are enabled, and individuals experience success and fulfillment, groups and organizations show an increased probability of functioning closer to optimality in the short and long term (e.g., Luthans, 2002). Realizing that employee curiosity can be decomposed into particular dimensions offers tantalizing insights into questions that have yet to be asked. For talent identification, what are the ideal curiosity profiles of effective leaders? For talent development, what strategies are most effective in cultivating Joyous Exploration versus Stress Tolerance versus Openness to People's Ideas? For some people, the issue will be failing to recognize novelty in seemingly familiar day-to-day tasks; for others, the issue will be an unwillingness to pursue new directions because of the discomfort that arises when exploring (e.g., Silvia, Henson & Templin, 2009). Too often, there is a process loss in groups because members are defensive instead of curious when exposed to questions, criticism, and alternative viewpoints (De Dreu, Nijstad & van Knippenberg, 2008; Harvey, 2014). With a reliable, valid, comprehensive measure, new research can explore the generative aspects of curiosity on creative and relational processes in organizational life.

Organizational science can no longer offer blanket statements as to whether someone is curious. It might prove fruitful to understand in what ways a person is curious and then determine whether their profile is aligned with subsequent job and relational demands. Despite a recent influx of research on curiosity in organizational settings (e.g., Celik et al., 2016; Harrison, 2012; Harrison & Dossinger, 2017; Mussel, 2013), we do not know the trajectory of these curiosity dimensions over one's career from a newcomer, to an instigator of change, to a leader in the organization. To what degree can formal workplace interventions alter these curiosity dimensions? How does workplace culture play a role in shaping these dimensions? Prospective, experimental, and intervention studies can address workplace curiosity and functioning as outcomes.

12.3. Strengths and limitations

We believe the comprehensiveness of our measurement approach—the use of two United States and two German samples of

workers from the adult population, the diversity of our outcomes, and a large battery of work related well-being and functioning scales—allows for confidence in our results. We also showed that the dimensions of curiosity offer incremental value above and beyond the robust, cross-cultural personality trait of mindfulness. Despite the proposed benefits of mindfulness in the workplace (Dane, 2011; Good et al., 2015), few studies have tested whether the benefits can be better explained by another psychological strength. Thus, we offer a set of findings on how curiosity accounts for more variance in work functioning than mindfulness with the exception of one outcome: work burnout. Interestingly, work burnout was the only maladaptive outcome measured in our research. Perhaps mindfulness is more relevant to the absence of negative outcomes at work whereas curiosity is more relevant to the presence of healthy outcomes. To pinpoint optimal targets of workplace interventions, more research is needed that compares and contrasts various psychological strengths touted as beneficial to employees, groups, and organizations. We argue for additional conservative tests of construct validity as a companion to simply exploring new constructs in work settings (e.g., Avey, Reichard, Luthans & Mhatre, 2011).

Our research also has limitations. We used self-report survey technologies, and all the limitations of this methodological approach are relevant. Some of the previously validated scales in our research contain complicated items about the work environment. The participants in our samples are sufficiently versed in computers to sign-up for online research platforms with the majority being highly educated. Future work should examine whether the findings uncovered are relevant to all working adults or circumscribed to workers with particular intellectual levels. In addition, the relevance and benefits afforded by curiosity needs to be examined in particular organizations and industries, as it is unclear for example whether curiosity would be equally relevant to coal miners, circus performers, and architects.

As for additional methodological concerns, each of the items in the M-Workplace Curiosity Scale were positively worded which might influence the presence of an overarching general factor. The general factor might be reflecting response bias, social desirability, and other common elements across items that are not unique to the construct of curiosity (evidence suggests a similar general factor in models of well-being; e.g., Disabato, Goodman, Kashdan, Short & Jarden, 2016; Longo, Coyne, Joseph & Gustavsson, 2016). Our data are cross-sectional and correlational, preventing any claims about causality. Future research should complement our self-report assessment approach with colleague and supervisor reports of employee curiosity within a longitudinal design.

13. Conclusion

William James (1890) argued that curiosity is a fundamental psychological motive, and that there is more than one dimension. Maslow (1943) argued that the desire to seek out novel information and experiences is a fundamental psychological need that “*makes the person bigger, wiser, richer, stronger, more evolved, more mature...It represents the actualization of a human potentiality, the fulfillment of that human destiny foreshadowed by human possibilities.*” Despite the pervasiveness of strengths in everyday life and psychological models, curiosity has only recently been subjected to deep empirical scrutiny. In the past, a single dimension has been proposed from incurious to curious (e.g., Mussel, 2013; Spielberger & Reheiser, 2004), with exceptions that inspired this research program (Litman & Silvia, 2006; Mussel, 2013; Reio et al., 2006).

We found evidence for four dimensions in two samples of workers from the United States and two samples from Germany, with parallel correlates across a broad range of healthy and unhealthy work related outcomes. Our findings show that two dimensions of curiosity in particular are strongly linked to workplace well-being and functioning: Stress Tolerance and Openness to People's Ideas. Neither of these dimensions are represented in the only existing measure of workplace

curiosity (Mussel, 2013). In both the United States and Germany, curiosity was far more relevant to work related outcomes compared with the personality trait of mindfulness — yet to date, only mindfulness work interventions have been tested (Virgili, 2015). The common targets of workplace interventions (e.g., Maslach, 2003; Truxillo, Cadiz & Hammer, 2015) such as job satisfaction, work engagement, innovative behaviors, and burnout also happen to be strongly related to each of the four curiosity dimensions. These results raise the possibility that curiosity enhancement strategies will be effective at creating optimal work environments for a plurality of employees. We hope this comprehensive model and measure of work related curiosity will inspire researchers and practitioners to better uncover how to identify, harness, and optimize human capital and create workplace environments where human beings can flourish.

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