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# Measuring Six Facets of Curiosity in Germany and the UK: A German-Language Adaptation of the 5DCR and Its Comparability with the English-Language Source Version

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## ABSTRACT

The five-dimensional curiosity-scale revised (5DCR) by Kashdan et al. (2020) is the most comprehensive curiosity inventory available to date. 5DCR measures six facets of curiosity with four items each. Here, we present a German-language adaptation of the 5DCR and comprehensively validate this adaptation in a diverse sample of adults from Germany ( $N = 486$ ). Moreover, we provide new evidence on the original English-language 5DCR in a parallel sample from the UK ( $N = 483$ ). In both countries, we investigate the six facets' reliability, factorial validity, and convergent and discriminant validity with a large set of individual-differences constructs. In addition, we analyze the measurement invariance of the curiosity facets across the UK and Germany and across socio-demographic subgroups defined by age, sex, and education. Findings demonstrate that the new German-language adaptation of 5DCR and its English-language source version show psychometric properties similar to the original studies by Kashdan et al. (2020) in the United States. All six curiosity facets reach at least partial scalar invariance across cultures, sex, education, and mostly also across age groups. The findings support the six-faceted theory of curiosity and show that 5DCR allows for a valid assessment of curiosity across cultures.

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The important thing is not to stop questioning. Curiosity has its own reason for existence. One cannot help but be in awe when he contemplates the mysteries of eternity, of life, of the marvelous structure of reality. It is enough if one tries merely to comprehend a little of this mystery each day.

~ Einstein (1955)

It is widely agreed upon that curiosity is a highly essential facet of human's psychology, described as a central human motivation by Maslow (1943), a universal human strength by Peterson and Seligman (2004), and as a basic pillar for academic performance (von Stumm et al., 2011). Curiosity entertains relevance in an abundance of fields of not just psychology but the social sciences in general. Applications from various fields make curiosity also important for the everyday life of people. An exemplary but not exhaustive list of curiosity's correlates includes cognitive development (Trudewind, 2000), academic learning (von Stumm et al., 2011), interpersonal closeness (Kashdan & Roberts, 2004), and personal (Kashdan et al., 2004) as well as professional growth (Mussel et al., 2012).

Although there exists an array of measurements for different dimensions of curiosity (e.g., Beauducel et al., 2003; Beißert et al., 2014; Berlyne, 1954; Haugtvedt et al., 1992; Litman,

2008; Zuckerman et al., 1964), none of them captures curiosity across different areas of social and intellectual life and physiology at the same time. To advance the measurement of curiosity, Kashdan et al. (2018) developed the five-dimensional curiosity scale (5DC) and recently revised it (5DCR) (Kashdan et al., 2020). The latest version, 5DCR, measures six facets of curiosity and showed promising psychometric properties in two large samples of adults from the United States. However, different from the original 5DC, a more extensive psychometric validation of the 5DCR in non-US cultures and an adaptation of the instrument in another language are still absent. The validation of measures across cultures and languages is a crucial step of the development of viable and theoretically sound measures of basic personality traits such as curiosity that are assumed to be human universals.

Here, we present a newly developed German-language adaptation of Kashdan et al.'s (2020) 5DCR. We comprehensively evaluate its psychometric properties (i.e., reliability, factorial validity, convergent, and discriminant validity) in a diverse sample of German adults. We compare the psychometric properties of the German-language adaptation to those of the first 5DCR's English-language source version tested outside the United States, namely, in a parallel sample of adults

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from the UK. Moreover, we test comparability of 5DCR across the two languages and countries as well as across major socio-demographic subgroups defined by age groups, sex, and education by means of measurement invariance tests.

### Six factors of curiosity: The 5DCR

Traditionally, research has conceptualized curiosity as a narrow construct with one or two highly correlated factors (e.g., Berlyne, 1954; Haugtvedt, 1992; Litman, 2008; Mussel et al., 2012). However, Kashdan et al. (2018), drawing from different lines of curiosity research (e.g., Kashdan et al., 2004; Renner, 2006; Roth & Hammelstein, 2012), argued that different conceptualizations of curiosity have tended to highlight different aspects and that curiosity is, hence, better conceived as a multifaceted construct. Distinguishing facets of curiosity aligns with a larger trend in personality psychology to study not only global traits but also more narrow facets in order to attain a more fine-grained description of individual differences, maximize predictive power for life outcomes, and gain a deeper understanding of psychological mechanisms (Danner et al., 2019).

To measure different facets of curiosity, Kashdan et al. (2018) developed a five-dimensional, nonhierarchical measure of curiosity, the five-dimensional curiosity scale (5DC). The inventory covers five curiosity facets that represent distinguishable psychological characteristics with their distinct cognitive processes that play a role in curious behavior: *Joyous Exploration* (JE), *Deprivation Sensitivity* (DS), *Stress Tolerance* (ST), *Thrill Seeking* (TS), and *Social Curiosity* (SC). The facet of Joyous Exploration refers to “the pleasurable experience of finding the world intriguing,” whereas Deprivation Sensitivity is defined as “the anxiety and frustration of being aware of information you do not know, want to know, and devote considerable effort to uncover” (Kashdan et al., 2020, p. 1). These two dimensions help the 5DC distinguish between the emotional valence of experiences of curiosity. Subsequently, the authors argued that a person will only be curious if they think that they can handle the distress that comes with unknown and novel stimuli (e.g., new situations and people). They (p. 2) characterize Stress Tolerance as “the dispositional tendency to handle the anxiety that arises when confronting the new.” Thrill Seeking is the opposite dispositional tendency to Stress Tolerance. It corresponds to desiring the arousal produced when seeking new experiences. Finally, Kashdan et al. present the social domain as a distinct facet of curiosity, named Social Curiosity.

More recently, Kashdan et al. (2020) further refined the 5DC inventory by splitting the latter facet into two separate facets: *Social Curiosity General* (SC\_G) and *Social Curiosity Covert* (SC\_C). The resulting revised inventory (5DCR) theorizes a six-dimensional, still nonhierarchical, curiosity structure. The authors’ intention in differentiating General from Covert Social Curiosity was to pay heed to findings suggesting that social curiosity comprises multiple dimensions (Litman & Pezzo, 2007; Renner, 2006). Furthermore, they surmised that this missing differentiation in the original 5DC (Kashdan et al., 2018) was responsible for the low criterion

validity of the social curiosity facet compared to the other four facets. By distinguishing two types of social curiosity, the revised inventory can better differentiate between a person’s motivation to understand other people’s behavior, thoughts, and feelings on the one hand (Social Curiosity General) and the motivation to discover details about other people, in “indirect, surreptitious, and secretive ways” on the other (Social Curiosity Covert, p. 2) (Kashdan et al., 2020). Moreover, the revised version contains several technical improvements: 5DCR presents each of the six facets in a briefer format comprising 4 instead of 5 items (i.e., 24 items measuring 6 facets compared to 25 items measuring only 5 facets in the 5DC). The authors removed the item with the lowest loading from each facet, resulting in a more internally consistent measure and a 20% reduced response time while maintaining sufficient levels of internal consistency (.80 to .90 in Kashdan et al., 2020). Factor analyses supported the six-dimensional structure of 5DCR assessed in an online questionnaire with two samples of adults from the United States. The six facets correlated moderately with each other, outlining their partial independence.

The nomological network established for the 5DCR so far is especially focused on the Big Five personality traits and the ten basic human values by Schwartz (Kashdan et al., 2020). Interestingly, all curiosity facets show relevant relations with the five personality dimensions, with Openness and Extraversion presenting especially pronounced correlations with the curiosity facets of 5DCR. The facet of Covert Social Curiosity is the only one among the six curiosity facets with relevantly lower associations to the Big Five Inventory. This overarching pattern of substantial relations between 5DCR and the Big Five personality traits proposes curiosity rather as an interstitial construct that stands for itself than just a subfacet of the Big Five. Kashdan et al. (2020) find the same pattern for correlational analyses with the Schwartz values. That is, the 5DCR’s curiosity facets show relevant associations with almost all ten basic human values. The Schwartz values of self-direction and stimulation show especially strong associations with all 5DCR curiosity dimensions. This observation aligns with the idea of curiosity as a combination of different traits and their processes to actively explore (see e.g., Joyous Exploration), experience (e.g., Thrill Seeking and Stress Tolerance), and learn (e.g., Deprivation Sensitivity and Social Curiosity) new aspects.

### The present study

5DCR represents the state of the art for assessing trait curiosity. It allows for a comprehensive and fine-grained assessment of six distinct facets of curiosity and integrates hitherto disparate conceptualizations of curiosity as related but distinct facets within a single inventory. These unique qualities have apparently propelled the scale’s popularity. Despite its recency, 5DCR’s predecessor 5DC has been widely used in research on curiosity. It has already been used in different countries (see e.g., Iran, Keshavarz, 2021; Israel) (Birenbaum et al., 2019; Schutte & Malouff, 2020) and adapted for applications in organizations (Kashdan

et al., 2020). However, translations into other languages of the revised version (5DCR) that measures six instead of five facets of curiosity are still missing, as are studies that explicitly test the 5DCR's validity in different non-US cultures. Also missing are studies that investigate the comparability of the curiosity inventory across languages and the most widely studied socio-demographic subgroups (i.e., age, sex, and education) by means of measurement invariance testing. The aims of the present study are fourfold. First, we introduce the newly developed German-language adaptation of Kashdan et al.'s (2020) 5DCR. We evaluate the adaptation's psychometric properties in a large and diverse quota sample of adults in Germany. Second, we accompany the validation of the translation with a replication and extension of Kashdan et al.'s (2020) original validation of the English-language source version of 5DCR in a new cultural context, namely, the UK. Third, we establish the nomological network for all six facets of 5DCR in both countries by testing the associations between the six curiosity facets and personality traits (i.e., Big Five, Schwartz values, and locus of control), potential outcomes of curiosity (e.g., life satisfaction or digital self-concept), and social desirability. Fourth, we test the comparability of the two language versions of the six-dimensional curiosity concept across Germany and the UK by means of measurement invariance testing performed on the full six-dimensional curiosity model as well as each facet separately. We also analyze the measurement invariance of the German-language and English-language source versions of the curiosity inventory across three major socio-demographic characteristics: age groups, sex, and educational attainment. By doing so, we provide further evidence on the theoretical generalization and cross-cultural applicability of 5DCR as a multi-faceted measure of curiosity, which can serve as a basis for future investigations of this fundamental aspect of human psychology.

## Method

### Samples

Our validation of the newly developed German-language adaptation of 5DCR, was based on an online quota sample of adults aged 18 to 69 years ( $M = 44$  years;  $SD = 15$  years) living in Germany, of whom 48.8% were male (51.2% female); and 23.7% had completed the general university entrance qualification (German *Abitur*). The sample reflected the heterogeneity of the adult population in Germany (Zensusdatenbank, 2011) regarding age, sex, and educational qualifications. We only recruited German native speakers for the sample to avoid language bias. The data collection was conducted in January 2020 via web-based surveys (computer-assisted self-administered interviewing, CASI) by the online access panel provider respondi AG. Respondents received a small financial reward for participation. To estimate test-retest reliability, we reassessed a subsample of 189 respondents in the second and third week after the initial data collection had ended ( $Mdn = 14$  days).

For our further validation of the English-language source version of the 5DCR and measurement invariance tests, we collected data from a parallel quota sample of adults from

the UK, aged 18 to 69 years ( $M = 44$  years;  $SD = 15$  years) of whom 48.4% were male (51.6% female) and 32.9% met the general matriculation standard. Like the German sample, the UK sample used a quota for age, sex, and educational strata and only English native speakers were recruited. Data collection for the English sample was identical to the German data collection. As for the German sample, we reassessed a subsample of respondents ( $N = 182$ ) in the second and third week after the initial data collection.

We screened data from both samples for invalid cases before proceeding to analyses. The exclusion procedure took all variables of the questionnaire into account, not just items of the 5DCR. Exclusion criteria were threefold. First, cases were excluded in which the individual fell into the bottom 5% of the sampling distribution of the within-person variance across items (Kemper & Menold, 2014). Second, participants were excluded if they fell into the top 2.5% of the sample distribution for the Mahalanobis distance (i.e., the difference of an individual's response vector from the average response vector in the sample) (Meade & Craig, 2012). Lastly, respondents were excluded if they took less than 1 s on average to respond to an item, showing an implausibly short response time. Each of the three criteria was sufficient for exclusion. That is, only respondents who met none of the three exclusion criteria were included in the analyses. The final sample sizes after excluding low-quality responses were 486 for Germany and 483 for the UK.

## Measures

### Curiosity (5DCR)

5DCR (Kashdan et al., 2020) comprises 24 items capturing six facets of curiosity with four items each. Respondents answer all items on a fully labeled 7-point-scale: *does not describe me at all* (1), *barely describes me* (2), *somewhat describes me* (3), *neutral* (4), *generally describes me* (5), *mostly describes me* (6), and *completely describes me* (7). All items except those of the Stress Tolerance facet are forward-keyed in relation to their respective facet and toward curiosity (i.e., higher values imply higher curiosity). The items of the Stress Tolerance facet are negatively keyed (i.e., higher values imply lower stress tolerance and lower curiosity).

We translated the English version of 5DCR into German using the gold standard of questionnaire translation, namely the TRAPD approach (Harkness, 2003; Zavala-Rojas, 2017). The method follows five steps (see Figure S1 in Supporting Information Appendix): translation, review, adjudication, pretesting, and documentation. First, two translators produced two draft translations of the inventory's items independently (translation). Second, the translators and an independent reviewer compared the different translations drafted by the translators and, through discussion, decided on the final translations of all 24 items of the 5DCR (review). This reviewing process consisted of several loops of the reviewer feedbacking the existing item translations and a subsequent adaptation of the translations corresponding to the new feedback. Third, an independent adjudicator compared the final draft of the German-language adaptation

**Table 1.** Final German translation of the items of 5DCR (Kashdan et al., 2020).

Facet	Item label	German-language translation	English-language source version
<b>Joyous exploration</b>	JE1	Ich sehe herausfordernde Situationen als Chance an, um zu wachsen und zu lernen.	I view challenging situations as an opportunity to grow and learn.
	JE2	Ich suche gezielt Situationen auf, in denen ich wahrscheinlich intensiv über etwas nachdenken muss.	I seek out situations where it is likely that I will have to think in depth about something.
	JE3	Es bereitet mir Freude, etwas über Themen zu erfahren, die mir noch unbekannt sind.	I enjoy learning about subjects that are unfamiliar to me.
	JE4	Ich finde es faszinierend, Neues zu lernen.	I find it fascinating to learn new information.
<b>Deprivation sensitivity</b>	DS1	Das Nachdenken über Lösungen für schwierige Probleme hält mich manchmal nachts wach.	Thinking about solutions of difficult conceptual problems can keep me awake at night.
	DS2	Ich beschäftige mich manchmal stundenlang mit nur einer einzigen Fragestellung, weil ich einfach nicht zur Ruhe komme, bevor ich die Antwort weiß.	I can spend hours on a single problem because I just can't rest without knowing the answer.
	DS3	Es frustriert mich, wenn ich keine Lösung für ein Problem finde, sodass ich mich dann noch mehr anstrengende, um eine Lösung zu finden.	I feel frustrated if I can't figure out the solution to a problem, so I work even harder to solve it.
	DS4	Ich beschäftige mich unaufhörlich mit Problemen, die aus meiner Sicht gelöst werden sollten.	I work relentlessly at problems that I feel must be solved.
<b>Stress tolerance</b>	ST1	Schon der geringste Zweifel kann mich davon abhalten, mich auf neue Erfahrungen einzulassen.	The smallest doubt can stop me from seeking out new experiences.
	ST2	Ich kann nicht mit dem Stress umgehen, der entsteht, wenn ich mich auf eine ungewisse Situation einlasse.	I cannot handle the stress that comes from entering uncertain situations.
	ST3	Es fällt mir schwer, neue Orte zu erkunden, wenn mir das Vertrauen in meine eigenen Fähigkeiten fehlt.	I find it hard to explore new places when I lack confidence in my abilities.
	ST4	Es fällt mir schwer, mich zu konzentrieren, wenn die Möglichkeit besteht, dass ich dabei von etwas überrascht werde.	It is difficult to concentrate when there is a possibility that I will be taken by surprise.
<b>Social curiosity general</b>	SC_G1	Ich finde gerne heraus, warum Menschen sich so verhalten, wie sie es tun.	I like finding out why people behave the way they do.
	SC_G2	Ich stelle viele Fragen, um herauszufinden, was andere interessiert.	I ask a lot of questions to figure out what interests other people.
	SC_G3	Wenn ich mit jemandem spreche, der von etwas begeistert ist, bin ich neugierig und will herausfinden, warum das so ist.	When talking to someone who is excited, I am curious to find out why.
	SC_G4	Wenn ich mit jemandem spreche, versuche ich interessante Details über meine Gesprächspartner zu erfahren.	When talking to someone, I try to discover interesting details about them.
<b>Social curiosity covert</b>	SC_C1	Wenn andere eine Unterhaltung führen, versuche ich herauszufinden, worum es darin geht.	When other people are having a conversation, I like to find out what it's about.
	SC_C2	Wenn ich von anderen Leuten umgeben bin, lausche ich gerne ihren Gesprächen.	When around other people, I like listening to their conversations.
	SC_C3	Wenn andere sich streiten, möchte ich gerne wissen, was los ist.	When people quarrel, I like to know what's going on.
	SC_C4	Ich versuche, an Informationen über das Privatleben meiner Mitmenschen zu kommen.	I seek out information about the private lives of people in my life.
<b>Thrill seeking</b>	TS1	Ich finde es aufregend, Risiken einzugehen.	Risk-taking is exciting to me.
	TS2	In meiner Freizeit mache ich gerne Dinge, die ein bisschen Nervenkitzel hervorrufen.	When I have free time, I want to do things that are a little scary.
	TS3	Spontane Abenteuer reizen mich viel mehr als geplante.	Creating an adventure as I go is much more appealing than a planned adventure.
	TS4	Am liebsten sind mir Freunde, die unberechenbar sind und mich überraschen.	I prefer friends who are excitingly unpredictable.

Note. Instruction: "Nachfolgend finden Sie Aussagen, mit denen sich Menschen oft selbst beschreiben. Bitte verwenden Sie die untenstehende Skala, um anzugeben, inwieweit diese Aussagen Sie genau beschreiben. Es gibt keine richtigen oder falschen Antworten. /Below are statements people often use to describe themselves. Please use the scales below to indicate the degree to which these statements accurately describe you. There are no right or wrong answers. Scale: 1 - trifft gar nicht zu/does not describe me at all; 2 - trifft nicht zu/barely describes me; 3 - trifft eher nicht zu/somewhat describes me; 4 - weder noch/neutral; 5 - trifft eher zu/generally describes me; 6 - trifft zu/mostly describes me; 7 - trifft voll und ganz zu/completely describes me.

with the original 5DCR instrument and approved the translation for the fieldwork (adjudication). Fourth, the newly developed instrument was pretested (pretest) and, lastly, the translation process and results were documented and combined in one reference work (documentation). **Table 1** shows the final translations into German of instructions, items, and scale labels along with the English source version.

### Validation criteria

To locate the six facets of the German-language adaptation of 5DCR in a nomological network and assess its convergent and discriminant validity, we investigated its relations to a

set of *key* personality and motivational traits. Our goal in including this broad range of correlates was to explore the nomological network of curiosity, including basic personality traits, values, and potential outcomes of curiosity. More specifically, we included (1) the Big Five personality traits Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness; (2) *basic human values*; and (3) locus of control. We selected the Big Five personality traits and basic human values because these constructs were also the focus in Kashdan et al.'s (2020) original validation study of 5DCR, allowing for direct comparisons of our results. We additionally included locus of control because it is a fundamental individual difference construct that falls outside the

Big Five and has important consequences for behavior and affect (e.g., Judge & Bono, 2001; Ng et al., 2006).

Furthermore, we added several individual difference constructs – beyond the correlates considered by Kashdan et al. (2020) – because they are of broad theoretical and practical importance and might be potential outcomes of a person's curiosity. These constructs were life satisfaction, political orientation, religiosity, physical health, and the digital self-concept (Schauffel et al., 2021). Lastly, we assess a person's social desirability to also test the German translation of 5DCR and its English source version for the UK against one of the most common survey biases. Below, we describe how we assessed each of these constructs.

**Big five personality traits.** We assessed the Big Five personality traits (Extraversion, Agreeableness, Neuroticism, Conscientiousness, and Openness) with the German-language version of the Big Five Inventory-2 Short Form (BFI-2-S; German version by Rammstedt et al., 2020; original English-language source version by Soto & John, 2017a). BFI-2 measures each Big Five dimension with three facets which were represented by one positively and one negatively keyed item each (i.e., 6 items per Big Five domain). Respondents rated the BFI-2 items on a 5-point-scale from *disagree strongly* (1) to *agree strongly* (5). Soto and John (2017b) and Rammstedt et al. (2020) provide support for the internal consistency of BFI-2(-S) as well as its content, external, and criterion validity.

**Basic human values.** We measured ten basic human values (i.e., Self-Direction, Power, Universalism, Achievement, Security, Stimulation, Conformity, Tradition, Hedonism, and Benevolence) with the Portraits Value Questionnaire (PVQ-21) (Schwartz, 2003) as implemented in the European Social Survey (ESS). Participants rated 21 items (two for each value plus an additional third item for Universalism) on a 7-point-scale from *very much like me* (1) to *not like me at all* (6). There was an additional option stating that the participant did not know an answer to the question. Schwartz et al. (2015) present support for the construct validity of PVQ-21. The test–retest reliabilities of the ten value scales are also satisfactory considering their brevity (Schwartz et al., 2015).

**Locus of control.** We captured people's perceived locus of control by The Internal–External Locus of Control Short Scale–4 (IE-4; German version by Kovaleva et al., 2014; English version by Nießen et al., 2021). Four items represented two dimensions of perceived control (internal and external control). One dimension was represented by two items each. Respondents rated the items on a 5-point-scale ranging from *does not apply at all* (1) to *applies completely* (5). IE-4 shows satisfactory internal consistency and test–retest reliability as well as content, factorial, and construct validity in both the German-language (Kovaleva et al., 2014) and the English-language version (Nießen et al., 2021).

**Social desirability.** We assessed social desirability with the German-titled “Kurzskala Soziale Erwünschtheit-Gamma”

(KSE-G) (Kemper et al., 2012; English version by Nießen et al., 2019). The measurement includes six items, half of them keyed positively and the other half keyed negatively. The 5-point-scale that was used for the assessment ranged from *does not apply at all* (1) to *applies completely* (5). Kemper et al. (2012) showed the internal consistency of the KSE-G, measured by McDonald's omega ( $\omega$ ) (Dunn et al., 2014; McDonald, 1999), to be satisfactory. Additionally, they found support for content, factorial, and construct validity.

**Political orientation.** The first of four constructs we assessed with single-item questions was political orientation. The item asked respondents to place themselves on a continuum from political “left” to “right”: “Many people use the terms ‘left’ and ‘right’ to describe differing political views. If you think of your own political views, where would you place them on this scale?” Respondents rated the item on an 11-point-scale from *left* (1) to *right* (10) with an additional option specifying that the participant did not know an answer.

**Digital self-concept.** Digital self-concept refers to individuals' mental representations and evaluations of their own competences in dealing with information and communication technology. We measured this construct with the newly developed inventory for digital self-concept (ICT-SC25) (Schauffel et al., 2021). Participants answered 25 items representing six subdimensions of the digital self-concept: General (GL, e.g., “I can operate digital systems.”), Communicate (CO, e.g., “It is easy for me to spread information through digital systems.”), Process and Store (PS, e.g., “I am good at assessing the relevance of digital data, information, and content.”), Generate Content (GE, e.g., “I can create digital data, information, and content on my own.”), Safe Application (SA, e.g., “I am good at protecting private data when using digital systems.”), and Solve Problems (SP, e.g., “It is easy for me to select suitable digital systems and to solve content problems.”). Participants answered the items on a 6-point-scale ranging from *strongly disagree* (1) to *strongly agree* (6).

**Religiosity.** We measured religiosity with a single-item question that read, “Regardless of whether you belong to a particular religion, how religious would you say you are?” Respondents rated that scale on an 11-point scale ranging from *not at all religious* (1) to *very religious* (11).

**Physical health.** We measured perceived physical health with a single-item question asking respondents “How is your health in general? Would you say it is ...” Respondents rated the item on a 5-point-scale ranging from *very good* (1) to *very bad* (5).

**Life satisfaction.** We measured life satisfaction with the following item: “The next question is about your general satisfaction with life. All things considered, how satisfied are you with your life these days?” Respondents gave their answers

on an 11-point scale ranging from *not at all satisfied* (1) to *completely satisfied* (11).

**Socio-demographic characteristics.** We measured three major socio-demographic characteristics with single-item questions to allow for a comprehensive socio-demographic description of the curiosity scale and for a test of measurement invariance across major socio-demographic subgroups: age (i.e., grouped in 18–30 years, 31–50 years, and >50 years), sex (i.e., male or female), and educational attainment (i.e., meeting the general matriculation standard and failing to meet this standard).

## Analyses

Our analyses comprised five steps.<sup>1</sup> First, we analyzed the descriptive statistics and zero-order correlations of all 24 items of the German-language adaptation of 5DCR. We report the mean, median, standard deviation, minimum and maximum, skewness, and kurtosis, respectively.

Second, we assessed the factorial validity of 5DCR through exploratory (EFA) and confirmatory factor analysis (CFA). The number of factors in the EFA models was fixed to six, mirroring the theoretical structure of the 5DCR presented by Kashdan et al. (2020). With this analysis, we attempted to replicate the factor structure of the 5DCR, with four specific items clustering together for each of the six facets. Additionally, we computed seven different CFA models via maximum likelihood estimation (MLR). One analysis concerned the direct replication of the complete six factor structure of the 5DCR assessed in the original paper (Kashdan et al., 2020). The additional six analyses addressed the factorial validity of every single facet theorized by Kashdan's (2020) model of curiosity.

Fourth, we estimated the reliability of 5DCR in terms of internal consistency ( $\omega$ ) and test–retest stability ( $r_{tt}$ ) over two weeks. We used  $\omega$  instead of the widely used Cronbach's alpha ( $\alpha$ ) because  $\alpha$  assumes equal factor loadings for all items (i.e., an essentially tau-equivalent measurement model), an assumption that is unlikely to hold for 5DCR.

Fifth, we report the construct validity of 5DCR by correlating the six facets of curiosity with the aforementioned constructs. The aim here was to embed the six curiosity facets in a nomological network spanning a broad range of individual-difference constructs (including both constructs covered in Kasdan et al.'s original study and some constructs not yet covered in their study, such as locus of control) to investigate divergent and convergent validity. We also compared the similarity of the correlations between curiosity and these constructs across countries.

Sixth and last, to investigate the comparability of 5DCR across Germany and the UK, we tested the measurement invariance of the German-language adaptation and the

**Table 2.** Descriptive statistics of all 24 items of the German translation of 5DCR.

Items	<i>M</i>	<i>Mdn</i>	<i>SD</i>	Min	Max	Skewness	Kurtosis
Joyoues Exploration - JE1	5.07	5	1.25	1	7	-.54	.73
Joyoues Exploration - JE2	4.32	4	1.44	1	7	-.15	-.27
Joyoues Exploration - JE 3	5.21	5	1.21	1	7	-.67	.79
Joyoues Exploration - JE 4	5.37	5	1.16	1	7	-.65	.69
Deprivation Sensitivity - DS1	4.49	5	1.69	1	7	-.46	-.62
Deprivation Sensitivity - DS 2	4.42	5	1.58	1	7	-.37	-.54
Deprivation Sensitivity - DS 3	4.70	5	1.47	1	7	-.65	-.01
Deprivation Sensitivity - DS 4	4.24	4	1.64	1	7	-.30	-.64
Stress Tolerance - ST1	4.25	4	1.59	1	7	-.06	-.81
Stress Tolerance - ST 2	4.20	4	1.67	1	7	-.08	-.88
Stress Tolerance - ST 3	4.24	4	1.70	1	7	-.11	-.85
Stress Tolerance - ST 4	4.23	4	1.64	1	7	-.05	-.89
Thrill Seeking - TS1	3.48	4	1.77	1	7	-.12	-1.03
Thrill Seeking - TS 2	3.49	4	1.77	1	7	-.13	-1.03
Thrill Seeking - TS 3	3.79	4	1.77	1	7	-.03	-.99
Thrill Seeking - TS 4	3.40	3	1.70	1	7	-.19	-.82
Social Curiosity General - SC_G1	4.82	5	1.50	1	7	-.53	-.12
Social Curiosity General - SC_G 2	4.45	5	1.53	1	7	-.51	-.22
Social Curiosity General - SC_G3	4.91	5	1.35	1	7	-.82	-.95
Social Curiosity General - SC_G4	4.89	5	1.29	1	7	-.82	1.19
Social Curiosity Covert - SC_C1	4.62	5	1.47	1	7	-.78	-.30
Social Curiosity Covert - SC_C 2	4.56	5	1.53	1	7	-.66	-.12
Social Curiosity Covert - SC_C 3	4.36	5	1.60	1	7	-.52	-.28
Social Curiosity Covert - SC_C 4	3.79	4	1.73	1	7	-.09	-.86

English source version by means of multiple-group CFA (Vandenberg & Lance, 2000; Widaman & Reise, 1997) with country as the grouping variable. Additionally, we tested the measurement invariance across major sociodemographic subgroups defined by age, sex, and educational attainment within the German and UK sample to assess comparability across different subgroups of the population. In each case, we tested four successive levels of measurement invariance: configural invariance (same measurement model), metric invariance (additionally same loadings), scalar invariance (additionally same intercepts), and strict or uniqueness invariance (additionally same residual variances). To decide on the achieved level of measurement invariance, we relied on conventional cutoffs for changes in fit indices when comparing models with different levels of invariance (Chen, 2007; Putnick & Bornstein, 2016; Rutkowski & Svetina, 2014). We tested the measurement invariance of the complete model of six facets based on the tau-congeneric model. We also compared the scale scores (unit-weighted means scores, manifest and latent) for each curiosity facet between countries.

## Results

### Descriptive statistics

We analyzed the descriptive statistics and reference ranges for the German-language adaptation of 5DCR. Table 2 shows the mean (*M*), median (*Mdn*), standard deviation (*SD*), minimum (Min) and maximum (Max), skewness, and kurtosis of all 24 single items of the six facets: Joyous Exploration (JE), Deprivation Sensitivity (DS), Stress Tolerance (ST), Thrill Seeking (TS), Social Curiosity General (SC\_G), and Social Curiosity Covert (SC\_C). For the inter-item correlations of all 24 single items, see Table A1 in the Supporting Information Appendix. The intercorrelations

<sup>1</sup>As is customary for initial translations of measurement instruments, all our analyses were exploratory in nature, meaning that we did not test or preregister hypotheses.



**Table 3.** Exploratory factor analysis of the German translation of 5DCR with six fixed factors and an oblique rotation method (*oblimin*).

Items	Factors					
	1	2	3	4	5	6
Joyoues exploration - JE1	.14	-.07	-.04	<b>.62</b>	.17	-.02
Joyoues exploration - JE2	.26	.02	.13	<b>.50</b>	>-.01	.03
Joyoues exploration - JE3	-.06	<.01	<.01	<b>.89</b>	.01	.06
Joyoues exploration - JE4	.03	<.01	.02	<b>.88</b>	>-.01	-.04
Deprivation sensitivity - DS1	.05	.04	<b>.76</b>	-.07	.07	-.02
Deprivation sensitivity - DS2	.01	-.05	<b>.95</b>	-.02	-.05	.04
Deprivation sensitivity - DS3	-.07	.06	<b>.70</b>	.19	<.01	.01
Deprivation sensitivity - DS4	.07	.16	<b>.63</b>	.04	.11	-.02
Stress tolerance - ST1	.01	<b>.69</b>	.16	-.07	.11	-.05
Stress tolerance - ST2	.07	<b>.79</b>	.02	.01	.05	-.07
Stress tolerance - ST3	-.03	<b>.84</b>	-.05	.04	-.07	.07
Stress tolerance - ST4	-.03	<b>.80</b>	.01	-.03	-.06	.07
Thrill seeking - TS1	<b>.84</b>	.05	-.01	.05	-.08	.10
Thrill seeking - TS2	<b>.94</b>	.01	-.01	-.01	-.01	>-.01
Thrill seeking - TS3	<b>.81</b>	-.12	.09	.05	.03	.02
Thrill seeking - TS4	<b>.75</b>	.08	-.02	-.02	.15	-.06
Social curiosity general - SC_G1	-.05	.15	.13	.26	<b>.39</b>	.04
Social curiosity general - SC_G2	.06	.04	.01	.01	<b>.78</b>	.01
Social curiosity general - SC_G3	<.01	-.05	.03	.01	<b>.88</b>	.01
Social curiosity general - SC_G4	-.03	-.01	>-.01	.06	<b>.76</b>	.14
Social curiosity covert - SC_C1	-.01	-.04	.04	.11	.18	<b>.63</b>
Social curiosity covert - SC_C2	-.04	.01	-.03	.03	.01	<b>.82</b>
Social curiosity covert - SC_C3	.06	.02	.08	-.04	<.01	<b>.78</b>
Social curiosity covert - SC_C4	.24	.13	-.04	-.07	.12	<b>.58</b>

between the manifest scores of the six facets of 5DCR in German were small to moderate,  $.15 \leq r \leq .62$  (see Table A2 in the Supporting Information Appendix).

## Factorial validity

### Exploratory factor analysis

To test whether the German-language adaptation of the 5DCR follows the same six-dimensional structure of the 5DCR reported by Kashdan et al. (2020), we computed an EFA with six factors in the German sample. Mirroring Kashdan et al.'s (2018, 2020) method, we used an oblique rotation method (*oblimin*) because these authors had found relevant correlations between the curiosity facets. The exploratory factor analysis for 5DCR resulted in a clear factor structure (see Table 3) that closely resembles the pattern found by Kashdan et al. Each set of four items loaded on the expected facet. Specifically, factor loadings of the items on their target facets for JE ranged from .50 to .89, for DS from .63 to .95, for ST from .69 to .84, for TS from .75 to .94, for SC\_G from .39 to .88, and for SC\_C from .58 to .82. As also shown in Table 3, secondary (non-target) loadings were largely negligible, ranging from <.01 to .26. The correlations between the factors ranged from  $-.08$  to .67.

Additionally, we conducted the same analysis with the original English-language 5DCR for the UK sample. Results were very similar to the pattern presented for the German-language adaptation of 5DCR (see Table A3 in Supporting Information Appendix), thus, replicating the internal structure of the English-language 5DCR from Kashdan et al. (2020) in a sample of native English speakers from outside the United States.

## Confirmatory factor analyses

Table 4 shows results for the CFA models for the joint model and for each individual curiosity facet. Besides inspecting the model Chi-Square test, we consulted the following fit indices to evaluate model fit: comparative fit index (CFI), normed fit index (NFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR).

All seven models, in respect to their complexity, showed a satisfying fit according to conventional guidelines (e.g., Byrne, 1994; Hu & Bentler, 1999; but see also against rules of thumb, Nye & Drasgow, 2011). The complete curiosity model of 5DCR with all six facets showed a fit very similar to the one reported by Kashdan et al. (2020) for the English original 5DCR. The six separate models per dimension each showed good fit according to CFI, NFI, and SRMR, whereas only RMSEA mostly exceeded conventional threshold. Inspection of model modification indices suggested that remaining misspecifications were trivial and could be easily remedied by introducing a single residual covariance per facet. The six curiosity facets showed mostly moderate correlations when modeled in a joint CFA analysis ( $.04 \leq |r| \leq .71$ ).

Again, we conducted the same analyses for the UK sample (see Table A4 in Supporting Information Appendix). According to the multiple fit indices, all seven models, like in the German adaptation, showed a satisfying fit with the factor structure, very similar to the results obtained by Kashdan et al. (2020). CFA loadings for the UK sample in the complete model ranged from .63 to .93, and most were in the .75 to .88 range, as shown in Figure S2 in the Supporting Information Appendix.

## Reliability

Table 5 shows the reliabilities of the six curiosity facets in the German sample. The values of  $\omega$  (for the facets and item-corrected) ranged from a good (Min = .81) to an excellent internal consistency (Max = .92). In addition, we estimated test-retest reliability of the scale scores across a two-week period which were all acceptable.

## Construct validity

Table 6 shows correlations of the Big Five personality traits, basic human ("Schwartz") values, Locus of Control, the Digital Self Concept, and four additional correlates (i.e., the single-item measures of life satisfaction, political orientation, religiosity, and physical health) with 5DCR's curiosity facets.

Closely mirroring recent correlational analyses by Kashdan et al. (2020), the 5DCR facets showed relevant associations with all Big Five personality traits ( $.01 \leq r \leq .49$ ), especially with Extraversion and Openness. However, even the highest correlations were small enough to support the discriminant validity of curiosity in relation to the Big Five. Only the facet of Covert Social Curiosity, like in the original findings by Kashdan et al. (2020), had noticeably smaller correlations with the Big Five.

**Table 4.** Confirmatory factor analyses for the whole 5DCR in German and each of its six facets.

Models	$\chi^2$	<i>df</i>	<i>p</i>	CFI	NFI	RMSEA (90% C.I.)	SRMR
Complete 6-factor model	772.54	237	<.001	.933	.906	.068 [.063, .074]	.063
Joyous exploration	30.01	2	<.001	.974	.921	.170 [.120, .226]	.035
Deprivation sensitivity	22.78	2	<.001	.981	.944	.146 [.096, .203]	.023
Stress tolerance	38.58	2	<.001	.963	.961	.194 [.144, .250]	.034
Thrill seeking	13.81	2	.001	.992	.991	.110 [.060, .168]	.014
Social curiosity general	4.59	2	.101	.998	.996	.052 [.000, .116]	.013
Social curiosity covert	21.97	2	<.001	.979	.977	.143 [.093, .200]	.026

**Table 5.** Reliability of the six curiosity facets of 5DCR in German.

	Two-week test–retest reliability ( $r_{tt}$ )	Internal consistency ( $\omega$ )	CI (90%)
Joyous exploration	.71	.87	[.849; .883]
Deprivations sensitivity	.71	.89	[.876; .903]
Stress tolerance	.70	.88	[.860; .891]
Thrill seeking	.80	.92	[.912; .931]
Social curiosity general	.68	.87	[.858; .889]
Social curiosity special	.69	.87	[.852; .884]

The curiosity facets also show relevant associations with basic human values ( $.01 \leq r \leq .59$ ), Conformity and Tradition being the only values with small associations and self-determination and stimulation being the highest correlates with 5DCR facets. None of the correlations was high enough to suggest a lack of discriminant validity of curiosity in relation to basic human values. This correlational pattern, too, mirrors the construct validity findings of the original work (Kashdan et al., 2020).

Moreover, we note moderate associations of the 5DCR with self-rated health and life satisfaction. The associations suggest that life satisfaction was higher in respondents with higher curiosity for all facets ( $.06 \leq r \leq .20$ ) except Deprivation Sensitivity ( $r = -.12$ ). Moreover, self-rated health is lower for people high on Joyous Exploration ( $r = -.14$ ) and Thrill Seeking ( $r = -.17$ ), specifically. We also draw attention to the moderate relations of the curiosity facets with social desirability ( $-.20 \leq r \leq .23$ ), suggesting that social desirability is especially relevant for responses about the Stress Tolerance facet. Lastly, the consistently strong correlations of the curiosity facets with the different areas of a person's digital self-concept, especially for Joyous Exploration ( $.48 \leq r \leq .55$ ) and Social Curiosity General ( $.31 \leq r \leq .38$ ), show that curiosity, in different ways, is important for digital exploration and online interaction.

In conclusion, we replicated the pattern of correlations from Kashdan's original work, with even nuanced correlational differences within a construct being reproduced (e.g., highest correlations between 5DCR and Self Determination and Stimulation and lowest correlations with Tradition and Conformity). Furthermore, we present relevant associations of curiosity with measures that are part of every large-scale survey (e.g., life satisfaction) and grow more relevant in an increasingly digitalized world (i.e., dSC). We also show these correlational analyses for the English source 5DCR in the UK sample (Table A5 in the Supporting Information Appendix).<sup>2</sup>

Additionally, Table A6 (Supporting Information Appendix) shows group differences for the means of the

manifest scale scores of the 5DCR facets in age (18 – 30 years vs. 31 – 50 years vs. >50 years), sex (female vs. male), and educational attainment (no general matriculation standard vs. general matriculation standard). We found no notable sex differences in curiosity. However, the educational level showed differences for both facets of social curiosity and Joyous Exploration specifically. Finally, age was an evident gradient for all six facets of curiosity, showing a decrease in curiosity with increasing age.

The pattern of correlations between the six curiosity facets and external criteria was highly similar across the German and the UK sample. This was statistically supported by the high profile correlation,  $r = .842$ , between the matrices of the two samples' construct correlates with the curiosity facets (see Table 6 & Supporting Information Appendix Table A5). It suggests that the nomological network of the six curiosity facets is highly similar across both countries.

### Measurement invariance

We tested the measurement invariances of the German-language translation of 5DCR and its English-language source version for the complete curiosity model and for each of the six facets separately. Results of all seven analyses are shown in Table 7.

According to the criteria of Chen (2007), Rutkowski and Svetina (2014), and Putnick and Bornstein (2016), all seven tested models reached *scalar* measurement invariance between the German and the UK sample (i.e., the factor loadings, intercepts, uniquenesses and factor variances were equal across countries). For the three facets Joyous Exploration, Deprivation Sensitivity, and Thrill Seeking, one item intercept (i.e., for JE 2, DS 4, and TS 2) had to be freed to reach satisfying values in the fit indices to attain partial scalar (intercept) invariance. Uniquenesses were still invariant in these cases. As three item intercept per facet remained equal across countries, according to Baumgartner and Steenkamp (1998) and Byrne et al. (1989), the means and variances of the respective scales can still be compared across countries without incurring bias.

<sup>2</sup>Except for the basic human values which were not assessed for the UK sample.

**Table 6.** Correlations of the curiosity facets with other individual difference constructs in the German sample.

Constructs	Joyous exploration	Deprivation sensitivity	Stress tolerance	Thrill seeking	Social curiosity general	Social curiosity covert
<b>Big five</b>						
Extraversion	<b>.384</b>	.145	<b>.251</b>	<b>.396</b>	<b>.379</b>	<b>.268</b>
Agreeableness	.120	-.039	.187	-.124	.171	-.026
Conscientiousness	.150	.026	.146	-.132	.055	-.041
Neuroticism	<b>-.214</b>	<b>.238</b>	<b>-.429</b>	-.107	-.027	.006
Openness	<b>.485</b>	<b>.263</b>	.166	.221	<b>.407</b>	.128
<b>Schwartz values</b>						
Self-direction	<b>.336</b>	.178	.116	.135	<b>.313</b>	.152
Power	<b>.253</b>	<b>.221</b>	-.086	<b>.306</b>	<b>.297</b>	<b>.384</b>
Universalism	<b>.272</b>	.125	.073	-.013	<b>.343</b>	.136
Achievement	<b>.362</b>	<b>.240</b>	-.084	<b>.303</b>	<b>.354</b>	<b>.376</b>
Security	.047	.022	-.012	-.174	.102	.057
Stimulation	<b>.384</b>	<b>.232</b>	.055	<b>.589</b>	<b>.360</b>	<b>.263</b>
Conformity	.053	.068	-.059	-.032	.112	.111
Tradition	.090	.024	.010	-.090	.106	.045
Hedonism	<b>.237</b>	.059	.073	<b>.273</b>	<b>.214</b>	<b>.216</b>
Benevolence	<b>.243</b>	.084	.102	-.033	<b>.312</b>	.120
<b>Locus of control</b>						
Internal	<b>.366</b>	.068	.187	<b>.243</b>	<b>.251</b>	<b>.153</b>
External	.022	<b>.286</b>	<b>-.429</b>	.106	.079	.149
<b>Digital self-concept</b>						
General	<b>.481</b>	.212	.055	<b>.221</b>	<b>.305</b>	<b>.227</b>
Communicate	<b>.542</b>	<b>.246</b>	.038	<b>.278</b>	<b>.342</b>	<b>.253</b>
Process & store	<b>.534</b>	<b>.248</b>	.032	<b>.313</b>	<b>.362</b>	<b>.267</b>
Generate content	<b>.547</b>	<b>.336</b>	-.029	<b>.376</b>	<b>.379</b>	<b>.311</b>
Safe application	<b>.497</b>	<b>.236</b>	-.003	<b>.267</b>	<b>.346</b>	<b>.216</b>
Solve problems	<b>.520</b>	<b>.273</b>	-.009	<b>.302</b>	<b>.339</b>	<b>.273</b>
<b>Social desirability</b>						
	.099	-.062	.233	-.194	.048	-.199
<b>Life satisfaction</b>						
	.195	-.124	.203	.063	.154	.126
<b>Political orientation</b>						
	-.083	.013	-.018	-.100	-.125	-.023
<b>Religiosity</b>						
	.102	.101	-.035	.096	.188	.094
<b>Health</b>						
	-.138	.027	-.108	-.172	-.062	-.120

Note. The correlation coefficients' interpretation is based on effect size guidelines proposed by Gignac and Szodorai (2016): relatively small effects ( $r \geq .10$ ), typical (medium) effects ( $r \geq .20$ ), and relatively large effects ( $r \geq .30$ ). According to these authors, a correlation of .20 corresponds to the 50th percentile of a meta-analytical distribution of correlations in individual differences research. Therefore, in the table, medium to large effects are highlighted in bold.

Because scalar or at least partial scalar invariance across cultures held for all curiosity facets, we can compare the scale scores of the facets across countries. A direct comparison of the composite scores of the six facets of curiosity between Germany and the UK supports the conclusion of the only minor measurement variance between the two cultures (Supporting Information Appendix Table A7), with the largest mean difference on the manifest scale scores amounting to a Cohen's  $d$  of .12. The also reported latent mean differences from the strict invariance model led to the same conclusion that cross-national differences in the levels of curiosity were negligible.

As regards measurement invariance across sociodemographic subgroups, both the German-language translation as well as the English-language version of 5DCR also show *strict* measurement invariance across sex (i.e., female and male), two levels of educational attainment (i.e., meeting the general matriculation standard and failing to meet this standard), and largely across three age groups (18–30 years, 31–50 years, and >50 years). We present all six respective analyses in the Supporting Information Appendix (Tables A8–A13).

## Discussion

5DCR measures six facets of curiosity with a total of 24 items. It is the first curiosity inventory that goes beyond conventional single- or two-dimensional models of curiosity

and is the most fine-grained and differentiated measure of curiosity to date. In the present article, we presented a German-language translation of 5DCR. We comprehensively validated this translation in a diverse quota sample from Germany ( $N = 486$ ). We also provided new evidence on the psychometric properties of the English-language source version of 5DCR in a parallel sample from the UK ( $N = 483$ ). In addition to validating the 5DCR-model in two cultures and adopting a new translation, we were the first to show the inventory's comparability across cultures, age, sex, and educational strata.

Our findings support the psychometric quality of both the German-language translation and English-language source version of 5DCR in terms of structural (factorial) validity, reliability, and external validity. The German translation closely replicated the factor structure of 5DCR in both Kashdan et al.'s (2020) original paper and in the UK sample in our own data collection. Each of the six facets was unidimensional and showed satisfactory levels of internal consistency as well as test–retest reliability over two weeks. Three key insights were gained by the pattern of correlations with construct-related variables. First, the associations of the six curiosity facets with Big Five personality traits and basic human values were highly similar between the 5DCR in the UK, the data of Kashdan et al. (2020) and its German-language translation. Second, the six facets are systematically related to personality traits and values but are sufficiently distinct from both, indicating discriminant validity. Third, the six facets often showed differential associations with

**Table 7.** Test of measurement invariance across the German and UK samples for the whole curiosity model and its six facets.

Models		Configural	Metric	Partial scalar	Scalar	Strict (scalar restriction)	Strict	
<b>Complete model</b>	$\chi^2$	1618.04	1642.37	<i>Not needed</i>	1823.46	<i>Not needed</i>	1931.64	
	<i>df</i>	474	492		510		534	
	<i>p</i>	<.001	<.001		<.001		<.001	
	CFI	.933	.932		.923		.918	
	RMSEA	.071	.070		.073		.074	
	CI (90%)	[.067; .075]	[.066; .074]		[.069; .077]		[.070; .077]	
	SRMR	.057	.057		.059		.060	
	$\Delta$ CFI		<.001		.009		.005	
	$\Delta$ RMSEA		.001		.003		.001	
	$\Delta$ SRMR		<.001		.002		.001	
	Decision		Accept		Accept		Accept	
	<b>Joyous exploration</b>	$\chi^2$	105.67	107.54	114.70	151.28	143.18	179.15
		<i>df</i>	4	7	9	10	13	14
<i>p</i>		<.001	<.001	<.001	<.001	<.001	<.001	
CFI		.959	.960	.958	.943	.943	.934	
RMSEA		.229	.172	.156	.171	.144	.156	
CI (90%)		[.193; .268]	[.144; .202]	[.131; .182]	[.147; .195]	[.123; .166]	[.136; .177]	
SRMR		.030	.032	.034	.050	.040	.053	
$\Delta$ CFI			.001	.002	.016	.015	.009	
$\Delta$ RMSEA			.057	.016	.001	.012	.015	
$\Delta$ SRMR			.002	.002	.018	.006	.003	
Decision			Accept	Accept	Reject	Accept	Reject	
<b>Deprivation sensitivity</b>		$\chi^2$	75.73	84.06	102.05	141.82	133.61	172.60
		<i>df</i>	4	7	9	10	13	14
	<i>p</i>	<.001	<.001	<.001	<.001	<.001	<.001	
	CFI	.968	.966	.959	.942	.947	.930	
	RMSEA	.192	.151	.146	.165	.138	.153	
	CI (90%)	[.156; .232]	[.123; .181]	[.121; .172]	[.142; .190]	[.118; .160]	[.133; .174]	
	SRMR	.026	.041	.048	.059	.048	.059	
	$\Delta$ CFI		.002	.007	.024	.008	.012	
	$\Delta$ RMSEA		.041	.005	.014	.008	.012	
	$\Delta$ SRMR		.015	.007	.018	<.001	<.001	
	Decision		Accept	Accept	Reject	Accept	Reject	
	<b>Stress tolerance</b>	$\chi^2$	64.93	64.94	<i>Not needed</i>	67.49	<i>Not needed</i>	73.25
		<i>df</i>	4	7		10		14
<i>p</i>		<.001	<.001		<.001		<.001	
CFI		.972	.974		.974		.973	
RMSEA		.177	.131		.109		.094	
CI (90%)		[.141; .217]	[.103; .161]		[.085; .134]		[.073; .115]	
SRMR		.025	.025		.026		.029	
$\Delta$ CFI			.002		.001		.001	
$\Delta$ RMSEA			.046		.033		.015	
$\Delta$ SRMR			<.001		.001		.003	
Decision			Accept		Accept		Accept	
<b>Thrill seeking</b>		$\chi^2$	56.53	61.81	64.490	114.16	96.77	146.93
		<i>df</i>	4	7	9	10	13	14
	<i>p</i>	<.001	<.001	<.001	<.001	<.001	<.001	
	CFI	.980	.980	.979	.961	.969	.951	
	RMSEA	.165	.127	.113	.147	.115	.140	
	CI (90%)	[.165; .204]	[.109; .171]	[.088; .140]	[.123; .171]	[.094; .137]	[.120; .161]	
	SRMR	.020	.031	.032	.043	.032	.043	
	$\Delta$ CFI		.001	.001	.018	.010	.010	
	$\Delta$ RMSEA		.053	.014	.008	.002	.007	
	$\Delta$ SRMR		.011	.001	.012	<.001	<.001	
	Decision		Accept	Accept	Reject	Accept	Reject	
	<b>Social curiosity general</b>	$\chi^2$	7.99	11.94	<i>Not needed</i>	19.39	<i>Not needed</i>	23.33
		<i>df</i>	4	7		10		14
<i>p</i>		<.001	<.001		<.001		<.001	
CFI		.998	.998		.996		.996	
RMSEA		.045	.038		.044		.037	
CI (90%)		[.007; .110]	[.000; .074]		[.011; .073]		[.000; .063]	
SRMR		.009	.021		.025		.026	
$\Delta$ CFI			<.001		.002		<.001	
$\Delta$ RMSEA			.007		.006		.007	
$\Delta$ SRMR			.012		.004		.001	
Decision			Accept	Accept	Reject	Accept	Reject	
<b>Social curiosity covert</b>		$\chi^2$	42.73	49.62	<i>Not needed</i>	64.27	<i>Not needed</i>	68.43
		<i>df</i>	4	7		10		14
	<i>p</i>	<.001	<.001		<.001		<.001	
	CFI	.982	.980		.974		.974	
	RMSEA	.141	.112		.106		.090	
	CI (90%)	[.105; .181]	[.084; .143]		[.082; .131]		[.069; .111]	
	SRMR	.021	.032		.038		.034	
	$\Delta$ CFI		.001		.006		<.001	
	$\Delta$ RMSEA		.027		.006		.016	
	$\Delta$ SRMR		.011		.006		.004	
	Decision		Accept		Accept		Accept	

other constructs and mostly moderate intercorrelations among each other ( $.04 \leq |r| \leq .71$ ), hinting that the facets each provide unique information about individual differences in curiosity.

Notably, we tested the measurement invariance of the curiosity inventory in both languages and found that 5DCR reaches partial scalar, scalar, or strict invariance across Germany and the UK. This implies that researchers can make valid comparisons with the mean of the scales' manifest scores across the two cultures. The presented exceptions of partial scalar invariance were specifically minor as in every case fixing the loading of one item was already sufficient to resolve misfit. This points to a rather marginal bias in measurement invariance which can be adjusted for by comparing latent rather than manifest scores for the respective curiosity facet.

Within both Germany and UK, 5DCR also reached strict measurement invariance across sex and educational strata, and widely reached scalar invariance across age groups. These findings are encouraging as they attest to the comparability of 5DCR across populations and subpopulations. Specifically, (partial) strict measurement invariance implies that comparisons of means, variances, and correlations across countries/languages as well as across demographic subgroups are valid and free from bias. This further strengthens the applicability and utility of 5DCR for research involving diverse populations or subgroups, including cross-cultural research involving German-speaking and English-speaking populations.

### **Limitations and future research**

Considering the intention-behavior gap (see e.g., Sheeran & Webb, 2016) a comprehensive account of a psychological constructs needs validation through behavioral measures. This is especially relevant for a concept like curiosity that has facets which are first and foremost describing the tendencies to specific actions (see e.g., Thrill Seeking). The construct's close connection to behavior also has the upside that behavioral measures should be especially diagnostic indicators of a person's different curiosity facets. The facets' diversity facilitates a multitude of ways to assess curious behavior, experimentally and non-experimentally. To name but one example, online surveys and in-person experiments can implement ways to chat with other participants after the study. The acceptance of or engagement in such social interaction might be a direct indicator of people's social curiosity, regarding their motivation to understand other people (General Social Curiosity) as well as their motivation to discover details about others (Covert Social Curiosity).

Moreover, the present study limited the assessment of a person's curiosity to the participant's self-report. This introduces potential biases, some of which are potentially correctable (e.g., social desirability by balanced item pairs) and some are nearly impossible to account for (e.g., impression management). In this regard, observer reports present a more robust alternative to self-reports which, however, are more difficult to realize in surveys. Nonetheless, future

testing of 5DCR should strive not just for the validation of the inventory through behavioral measures and observer reports (e.g., from peers, colleagues, partners).

Lastly, the present article purports the utility of translating the 5DCR into German and validating its underlying factor structure in two new cultures. Future research should be encouraged to attempt further translations of the six-dimensional curiosity scale in other languages and its validations in other cultures.

### **Practical implications**

In a world that continuously accelerates its information exchange (see e.g., Lorenz-Spreen et al., 2019) and grows in complexity, curiosity is a key asset of a person's psychology to keep up with changes and stay informed. 5DCR provides the opportunity to capture people's curiosity on different levels and allow investigations of curiosity's effects on how people cope with complex, uncertain environments. Scoring curiosity on different facets, further, makes it possible to evaluate which type of curiosity may be of importance to navigate specific environments. For example, people scoring high on Joyous Exploration might be handling situations very well, that present much uncertainty and ask for a demand to actively explore. In another vein, Thrill Seeking might be a basic mental requirement for extreme sports, not just reducing experienced fear but even equipping a person with the desire to engage in fearful scenarios and test personal limits.

On a similar note, an exhaustive assessment of curiosity is an invaluable asset for recruitment. Capturing the unique drive or motivation to learn continuously seems a fundamental predictor for success in a diverse array of jobs, like technological invention, business development, or any scientific endeavor. An exhaustive, multidimensional account of an applicant's curiosity is informative for the company or institution but also the applicants themselves to find a fitting and, hence, productive and fulfilling area of expertise.

### **Conclusion**

It is widely agreed upon that curiosity is a highly essential facet of human's psychology. The five-dimensional curiosity-scale revised (5DCR) introduced by Kashdan et al. (2020) is the most recent and comprehensive inventory of curiosity. We present cross-cultural evidence that supports the theory of a six-facetted structure of curiosity in samples from outside the United States, namely Germany and the UK. In the process, our study offers two other novel contributions. First, we develop and validate a German-language adaptation of the original English source version of 5DCR. Second, we present the first test of comparability of this curiosity theory across different cultures and socio-demographic segments (i.e., age, sex, and education). Given its brevity (24 items with a completion time of typically <2 min) and comparability across major socio-demographic strata, it is an economical and broadly applicable measurement instrument. In conclusion, the present article supports the argument for

Kashdan's fine-grained structure of curiosity, advances the inventory's applicability beyond one language, and supports the theory's generalizability to the German-speaking and the UK-English-speaking context.

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## Data availability statement

All the presentation material, participant data, and analyses can be found on this paper's project page on OSF, Open Science Framework (<https://osf.io/vkfa3/>).

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