Motiv Emot (2007) 31:159–173
DOI 10.1007/s11031-007-9068-7

ORIGINAL PAPER

Curiosity and pathways to well-being and meaning in life: Traits, states, and everyday behaviors

Todd B. Kashdan · Michael F. Steger

Published online: 11 September 2007

Abstract This study examined curiosity as a mechanism for achieving and maintaining high levels of well-being and meaning in life. Of primary interest was whether people high in trait curiosity derive greater well-being on days when they are more curious. We also tested whether trait and daily curiosity led to greater, sustainable well-being. Predictions were tested using trait measures and 21 daily diary reports from 97 college students. We found that on days when they are more curious, people high in trait curiosity reported more frequent growth-oriented behaviors, and greater presence of meaning, search for meaning, and life satisfaction. Greater trait curiosity and greater curiosity on a given day also predicted greater persistence of meaning in life from one day into the next. People with greater trait curiosity reported more frequent hedonistic events but they were associated with less pleasure compared to the experiences of people with less trait curiosity. The benefits of hedonistic events did not last beyond the day of their occurrence. As evidence of construct specificity, curiosity effects were not attributable to Big Five personality traits or daily positive or negative mood. Our results provide support for curiosity as an ingredient in the development of well-being and meaning in life. The pattern of findings casts doubt on some distinctions drawn between eudaimonia and hedonic well-being traditions.

T. B. Kashdan (✉)
Department of Psychology, George Mason University, MS 3F5, Fairfax, VA 22030, USA
e-mail: tkashdan@gmu.edu
URL: http://mason.gmu.edu/~tkashdan

M. F. Steger
University of Louisville, Louisville, KY, USA

Keywords Curiosity · Happiness · Meaning in life · Hedonism · Pleasure · Positive emotion

Introduction

Perhaps one of the most important aims for psychology is to discover mechanisms that enable people to achieve high, durable well-being. This is not a simple task because well-being is highly heritable, relatively stable and people easily adapt or habituate to positive life events (e.g., Diener et al. 1999; Lykken and Tellegen 1996; Lyubomirksy et al. 2005). Several studies have examined how interpersonal processes such as gratitude and kindness influence well-being (e.g., Emmons and McCullough 2003; Otake et al. 2006). We advocate an additional approach that focuses on curiosity or the tendency to seek out and thrive on novel, complex, and challenging interactions with the world. These exploratory and novelty seeking tendencies focus attention and behavior toward activities that facilitate learning, competence, and self-determination (Berlyne 1960, 1967) from which enduring meaning and well-being can be derived. The present investigation focuses on the role of curiosity in the sustainability of well-being in everyday life.

Curiosity has been described as a core motivational mechanism of the biologically-based system of reward sensitivity (Depue 1996) and intrinsic motivation (Ryan and Deci 2000), which in turn, are central to well-being. Curiosity is an appetitive state involving the recognition, pursuit, and intense desire to investigate novel information and experiences that demand one's attention. People with greater trait curiosity experience curiosity states more frequently, intensely, and for a longer duration than less trait curious peers (Day 1971). By intentionally seeking

novel and challenging events, people with greater curiosity stretch or expand their knowledge, skills, and goal-directed efforts (e.g., Ainley et al. 2002). Curiosity can be distinguished from other positive emotions in that it focuses on growth and expansion, whereas enjoyment-related feelings are associated with a preference for familiarity, simplicity, and stability (Crozier 1974; Cupchik and Gebotys 1990). For instance, curiosity motivates us to experiment with new and interesting dishes at a restaurant; joy motivates us to choose our favorite meal that regularly satisfies us. Curiosity therefore is distinct from enjoyment and promising as a mechanism in the development of well-being.

Previous work shows that people scoring higher on trait curiosity scales report greater well-being (e.g., Naylor 1981; Park et al. 2004; Vittersø 2003; Wanberg and Kammeyer-Mueller 2000). However, this work is limited to cross-sectional and laboratory methods with minimal ecological validity. To extend results derived from traditional methods, we used a daily diary approach. Daily diary approaches involve multiple measurements of people over the course of time in the real-world contexts in which they live. With this approach, we can examine the types of events that are relevant in the everyday lives of people with greater trait curiosity and whether the frequency and sensitivity to these events are associated with well-being. Because well-being is not a unitary construct, in this paper, a growth-oriented model is contrasted with a hedonistic model. Curiosity is expected to operate differently in each model.

Two models of well-being and the relevance to curiosity

To examine relations among curiosity, everyday events, and well-being, it may prove useful to distinguish different well-being processes. The two major theoretical models of well-being in the social sciences are eudaimonic and hedonic well-being (with hedonism being a lower-order facet of hedonic well-being) (Ryan and Deci 2001). Despite some overlap, there are data to suggest their distinction (Keyes et al. 2002; Waterman 1993).

Eudaimonic well-being is characterized by strivings to develop one's potential and an orientation of openness to the tension and excitement of life challenges and uncertainty (Ryan and Deci 2001; Ryff and Singer 1998). Eudaimonic well-being is less about feeling good and more about being aware of emotions and thoughts, expressing them openly, and acting on them to be congruent with one's true self (Ryan and Deci 2001). Yet, positive feelings can be one of the payoffs from attempting to maximize abilities and capacities. Representative behaviors include developing life goals that fit with personal values, overcoming obstacles to these life goals, being authentic, and trying to better understand the self and others. In contrast to markers of hedonic well-being, eudaimonic well-being has stronger relations to being challenged, striving for mastery and competence, and effort expenditure (Waterman 1993). Behaviors that are intentional and effortful best facilitate lasting changes in well-being (Lyubomirsky et al. 2005). Thus, eudaimonic behaviors were expected to be a primary process in paths to meaningful living.

Hedonic well-being is characterized by frequent and enduring positive affect, low levels of negative affect, appraisals that life components are satisfying, and behaviors that preserve these states (Kahneman et al. 1999; Waterman 1993; Vittersø 2003). Distilled to its essence, hedonic well-being is about people's feelings and beliefs that the life they are leading is satisfying (Franks and Hefernan 1998). Although positive feelings can derive from any activity, pleasant social interactions, physical activities (e.g., exercise, aromatherapy), and prototypical "hedonistic" pursuits such as substance use, sex, and material consumption are more likely to produce this outcome (Clark and Watson 1988; Dubé and Le Bel 2003; Kasser 2002).

In the present study, we focused on only one lower-order facet of hedonic well-being: hedonism. Reasons include the relevance to our college student sample, use of hedonistic behaviors as mood boosting strategies in Western culture, linkage to the sensation-seeking variant of curiosity (Oishi et al. 2001; Zuckerman 1979), and distinction from behaviors reflecting eudaimonic well-being. Hedonism is only one of several facets of hedonic well-being.

Overview of theoretical framework and hypotheses

Theory and data suggest that people derive particularly positive experiences during activities that fit with their habitual behavior tendencies (i.e., dominant personality traits) and the least pleasure when they engage in behaviors counter to these tendencies (Côté and Moskowitz 1998). Based on this behavioral congruence model, people high and low in trait curiosity should differ in their pathways to well-being. Because a hallmark of curiosity is intentional engagement with novel and challenging stimuli, pathways to well-being for highly curious people should include novel and challenging experiences. These different pathways are presented in Figs. 1 and 2.

Growth-oriented pathway

The growth-oriented pathway in Fig. 1 is exemplified by behaviors requiring effort and intention (e.g., persevering

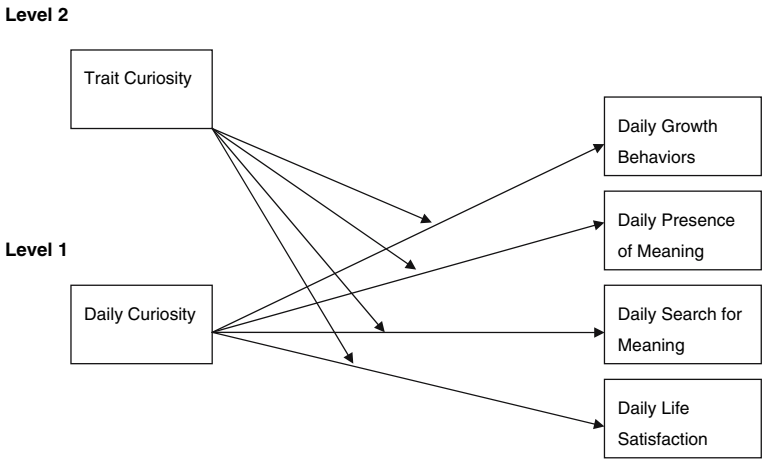

Fig. 1 Curiosity and pathway to growth-oriented well-being. *Notes:* Cross-level interactions in a two-level model

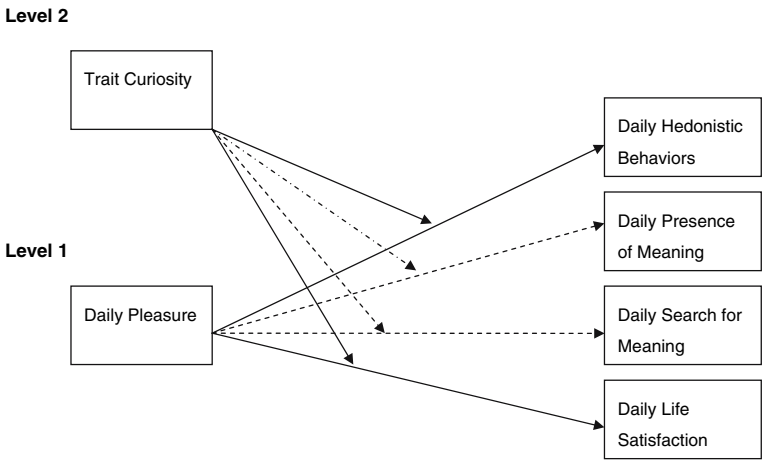

Fig. 2 Curiosity and pathway to hedonistic well-being. *Notes:* Cross-level interactions in a two-level model. Dotted lines reflect effects that are not hypothesized

at goals despite obstacles), the detection and presence of meaning in life, the search for meaning in life, and life satisfaction. Each of these components was expected to be particularly relevant to people high in trait curiosity, who are predisposed to an orientation of curiosity and openness to present experiences. Our model was predicated on the broadening and building process of curiosity (Fredrickson 1998) and behavioral congruence models of personality (Côté and Moskowitz 1998). Integrating trait and state personality, people with greater trait curiosity who feel more intense states of curiosity on a given day were expected to engage in more frequent growth-oriented behaviors and derive greater well-being and meaning in life.

Why would curiosity direct people to pursue growth opportunities and extract more rewards from them? People feel intensely curious when they appraise events as highly novel or challenging and also believe they are competent enough to understand it. Research shows that people spend the most time exploring challenging stimuli when novelty, challenge, and perceived competence appraisals are at their highest levels (Silvia 2005; Turner and Silvia 2006). Since people with greater trait curiosity commonly feel curious, it can be presumed that they frequently (a) recognize novel and challenging events and (b) believe they can competently engage in these events (Silvia 2006). This appraisal model provides a parsimonious explanation for what makes curious people curious and why they invest in certain events on a given day. We argue that highly curious people's greater recognition of the growth potential of challenging events generates exploratory behavior and desirable outcomes such as well-being.

People with greater trait curiosity are likely to seek out novel and challenging events more frequently (broadening effect). Taking part in growth-oriented behaviors should inevitably enhance psychological and social resources (building effect). We propose that people high in trait curiosity are particularly sensitive to the benefits of being curious. Thus, these benefits should be amplified on days when they are particularly curious. In this study, these benefits are defined as the frequency of growth-oriented behaviors and the experience of meaning in life and life

satisfaction. Conversely, less trait curious people's dominant tendencies (and appraisal patterns) are incongruent with novelty and challenge and do not attract them to the types of events that produce personal growth and meaning in life. Thus, less trait curious people should experience less curiosity and be less sensitive to the benefits of being curious.

We also propose a temporal sequence with the experience of curiosity contributing to the building of meaning in life over time. Arguably, meaning in life is a process of being able to connect activities to highly valued aims, feeling a sense of competence and control in life, and/or having positive self-regard as a result of one's actions (Baumeister 1991). Curiosity has been linked to intrinsically motivated values and goal pursuit (Ryan and Deci 2000; Sansone and Smith 2000), the building of knowledge and skills (Silvia 2006), and feelings of competence (Spielberger and Starr 1994; White 1959). Acting on feelings of curiosity and engaging in growth-oriented behaviors is a reasonable route to pursuing and extracting meaning in day-to-day life. Greater curiosity on a given day was expected to predict a greater sense of meaning and the continued investment in the search for new sources of meaning from one day to the next. Besides meaning in life, daily life satisfaction was included to provide an outcome that reflects the overall cognitive appraisals of one's life on a given day. Since life satisfaction captures aspects of eudaimonic and hedonic well-being, its relation with curiosity was more speculative.

Hedonistic pathway

Hedonistic well-being is exemplified by the daily experience of sensory pleasure and relevant behaviors (e.g., going for a walk, masturbating). This pathway to well-being, in Fig. 2, reflects how people differing in trait curiosity react to the experience of pleasure in a given day. In terms of behavioral congruence models of personality, the experience of pleasure does not reflect the dominant preference of people with greater trait curiosity for potential challenge and personal growth. Thus, people with greater trait curiosity were not expected to derive greater well-being as a result of the amount of pleasure in their day. In contrast, less trait curious people were expected to be attuned to the more primal motivation to maximize pleasure and minimize pain (as opposed to being interested in personal growth potential). Thus, less trait curious people were expected to be more sensitive to the benefits of sensory pleasure and immediately gratifying hedonistic behaviors.[1] The experience of pleasure was expected to be rewarding but short-lived. Unlike daily curiosity, there is no reason to expect daily pleasure to contribute to the development and maintenance of well-being and meaning in life (Veenhoven 2003). Despite the appeal of this framework, the present investigation is one of the first to examine temporal examinations of curiosity and everyday hedonism.

Hypothesis tests

Our primary hypotheses centered on cross-level interactions between trait curiosity and daily experiences. We predicted that people with greater trait curiosity would derive the greatest well-being and meaning in life on days when they were most curious (Fig. 1) whereas less trait curious people would report the more frequent hedonistic activity on days when they experienced the most pleasure (Fig. 2). We also predicted a temporal sequence such that greater curiosity on a given day was expected to predict greater meaning in life and the intentional search for meaning from one day to the next. There was no theoretical rationale for expecting the reverse sequence with greater meaning in life on a given day predicting high, persistent curiosity. To test the construct specificity of curiosity, Big Five personality traits and daily positive and negative affect were included as alternative explanatory variables.

Method

Participants

Of 111 introductory psychology students who participated, daily reports were returned by 106 people. Three participants provided invalid response patterns and six failed to complete the primary measures. This led to a final sample of 97 participants (33 male, 64 female; mean age of 19.75, *SD* = 3.20). The final sample was predominantly Caucasian (76%) or Asian-American (14.5%), with a small percentage of African-American (4.2%), Hispanic-American (2.1%), and Native-American (2.1%) students (and 1 student reporting "other").

[1] Existing data suggest an alternative model such that people with greater trait curiosity report more frequent hedonistic behaviors. Pleasure may be a common outcome of more curious individuals' exploratory tendencies and reward-seeking behavior toward sensory experiences (Oishi et al. 2001). Hedonistic behaviors may be particularly frequent for people taking risks to sustain their high threshold for stimulation and adverse reaction to boredom (the sensation-seeking variant of curiosity; Zuckerman 1979). However, the present study measured general curiosity as opposed to the specific dimension of sensation-seeking.

Participants completed an initial questionnaire packet in small groups. Subsequently, they were provided with a packet containing 21 daily report forms and instructed to complete one form at the end of each day over the next three weeks. They were told that if they forgot to complete it the prior night, completing it within an hour of awaking the next morning was satisfactory. Instructions and compliance were followed-up by two to three emails per week and at the mid-point, they were given a reminder in class about the importance of completing it on a daily basis and data integrity issues.

Global self-report measures

Trait curiosity

Using a 7-point Likert scale, participants completed the 7-item Curiosity and Exploration Inventory (CEI; Kashdan et al. 2004); rated from 1 (strongly disagree) to 7 (strongly agree). The CEI assesses two components of curiosity: tendencies to seek out novel and challenging experiences (Exploration; e.g., "I would describe myself as someone who actively seeks as much information as I can in a new situation") and flow-like engagement in activities that capture one's attention (Absorption; e.g., "When I am participating in an activity, I tend to get so involved that I lose track of time"). The combined total score was used in this study (α = .83). Construct validity has been shown in several factor-analytic and laboratory studies (e.g., Litman and Silvia 2006; Silvia 2005).

Trait meaning in life

Using a 7-point Likert scale, participants completed the 10-item Meaning in Life Questionnaire (MLQ; Steger et al. 2006); rated from 1 (absolutely untrue) to 7 (absolutely true). With two 5-item subscales, the MLQ measures the presence of and the search for meaning. The Presence subscale assesses cognitive appraisals of whether life is meaningful (e.g., "I have a good sense of what makes my life meaningful"). The Search subscale assesses general tendencies to actively seek meaning and purpose in life (e.g., "I am seeking a purpose or mission for my life"). A multitrait-multimethod matrix study provided support for excellent convergent and discriminant validity from life satisfaction, optimism, and self-esteem, and evidence for reliability and stability has been strong (Steger and Kashdan 2007; Steger et al. in press b). Respective alpha coefficients for the Presence and Search subscales were .82 and .88.

Trait positive and negative affect

Using a 5-point Likert scale, participants completed the 20-item trait version of the Positive and Negative Affect Schedule (PANAS; Watson et al. 1988); rated from 1 (very slightly) to 5 (extremely). The 10-item PANAS-PA and 10-item PANAS-NA subscales assess general tendencies to feel activated positive and negative emotions, respectively. Alpha coefficients for the trait PA and NA subscales were .86 and .88.

Satisfaction with life scale (SWLS)

Using a 7-point Likert scale, participants completed the 5-item SWLS (Diener et al. 1985); rated from 1 (strongly disagree) to 7 (strongly agree). The SWLS measures general positive cognitive appraisals of life with items (e.g., "In most ways my life is close to the ideal"). The alpha coefficient was .89.

Big five personality

Participants completed a 25-item measure of Big Five personality traits (Brody and Ehrlichman 1997) by rating items from 1 (Not at all true of me; I almost never feel this way) to 5 (Very true of me; I am very often this way). Extraversion (e.g., outgoing; α = .79), neuroticism (e.g., tense; α = .80), openness to experience (e.g., imaginative; α = .63), agreeableness (e.g., kind; α = .76), and conscientiousness (e.g., responsible; α = .77) were each measured with five adjectives.[2]

Daily measures

The reliability and validity of daily measures were examined using the multilevel random coefficient modeling software program hierarchical linear modeling (HLM) 6.0 (Raudenbush et al. 2004). Reliability coefficients reflect true variance divided by total variance. The validity for

[2] In recent years, more extensive psychometric evidence regarding other, even briefer, Big Five measures has been published (e.g., Gosling et al. 2003). We were not aware of these measures at the time the present study was designed. The scale we used is quite similar to other brief Big Five measures. The items for each dimension are as follows: (1) Openness—imaginative, intelligent, original, insightful, clever, (2) Conscientiousness—organized, thorough, efficient, responsible, practical, (3) Extraversion—talkative, assertive, active, energetic, outgoing, (4) Agreeableness—sympathetic, kind, softhearted, warm, generous, and (5) Neuroticism—tense, anxious, nervous, worrying, self-pitying.

daily curiosity, meaning, and life satisfaction measures were examined by calculating the between-person variance in daily outcomes accounted for by relevant trait scales (Bryk and Raudenbush 1992, p. 65). For example, we estimated the residual variance in an unconditional model (with no other Level-1 or Level-2 predictors) to predict daily curiosity as well as the residual variance from a second model with trait curiosity as a predictor of daily curiosity. Calculating the reduction in residual variance from the first to second model leads to a percentage (e.g., 16%) and the square root of this value (.40) leads to a corresponding correlation coefficient. For this investigation, validity was only examined for daily constructs that were also measured at the trait level. Summary statistics are reported in Table 1.

Daily curiosity

Curiosity and exploration experienced during the day was measured with four items; rated from 1 (strongly disagree) to 7 (strongly agree). We modified CEI items with the highest factor loadings (Kashdan et al. 2004). Items included, "I was actively seeking as much information as I could in new situations," "When I was participating in activities, I was so involved that I lost track of time," "I frequently found myself looking for new opportunities to grow as a person (e.g., information, people, resources)," and "Everywhere I went, I was out looking for new things or experiences." Daily curiosity had a corresponding correlation of .42 with the trait CEI and .29 with the SWLS. The difference between these correlations approached statistical significance, $t(94) = 1.30$, $p < .10$ (tests of dependent correlations were one-tailed). Results suggest acceptable construct validity.

Daily growth-oriented and hedonistic behaviors

A 14-item growth-oriented and hedonistic behavior checklist was used to assess behaviors indicative of different well-being models (Steger et al. in press a). The behaviors on the checklist have high content validity according to expert ratings, have been shown to be reliable in multilevel models, and reports appear to relatively free of socially desirable response biases (Steger et al. in press b). Examples from the 7-item growth-oriented behavior subscale include, "Expressed my gratitude for something someone did for me either verbally or in writing," "Confided in another person about something very important to me," "Persevered at a valued goal even in the face of obstacles," and "Wrote out my goals for the future." The items reflect proactive social behaviors and generating and sustaining goal-directed efforts. Examples from the 7-item hedonistic behavior subscale include, "Had sex purely to get pleasure," "Got drunk," and "Kept eating more than I intended of something just because it tasted so good." For all analyses, average scores on the daily growth-oriented and hedonistic scales were used, respectively.

Daily meaning in life and life satisfaction

Daily presence of meaning was measured with two face-valid items, "how meaningful does your life feel?" and "how much do you feel your life has purpose?" Daily search for meaning was measured with two face-valid items, "How much were you searching for meaning in your life today?" and "How much were you looking to find your life's purpose?" Items were rated from 1 (not at all) to 7 (extremely). Daily presence of meaning had a corresponding correlation of .64 with trait MLQ-presence and

Table 1 Summary statistics of daily measures

	Mean (*SD*)	# of Items	Score range	Reliability	Validity
1. Curiosity	14.56 (5.37)	4	4–28	.94	.42
2. Growth-oriented behaviors	1.68 (.95)	7	.10–4.19	.95	N/A
3. Hedonistic behaviors	.69 (.53)	7	0–2.71	.90	N/A
4. Presence of meaning	9.55 (2.69)	2	2–14	.97	.64
5. Search for meaning	7.18 (3.13)	2	2–14	.98	.33
6. Life satisfaction	4.76 (1.47)	1	1–7	.97	.68
7. Pleasure	3.86 (1.93)	2	2–10	.95	N/A
8. Positive affect	13.85 (4.88)	5	5–25	.94	.48
9. Negative affect	9.49 (3.81)	5	5–25	.93	.58

Notes: N/A = Not available because there are no relevant trait measures in the dataset to examine correlations with these daily measures. Descriptive data for growth-oriented and hedonistic behaviors reflect average daily frequency counts. Reliability coefficients reflect true variance divided by total variance. The validity for daily curiosity, meaning, life satisfaction, affect measures were examined by calculating the between-person variance in daily outcomes accounted for by relevant trait scales (Bryk and Raudenbush, 1992, p. 65)

.30 with trait MLQ-search. The difference between these correlations was statistically significant, $t(94) = 4.18$, $p < .001$. Daily search for meaning had a corresponding correlation of .33 with trait MLQ-search and a smaller relation of .16 with trait MLQ-presence. Although the difference was not statistically different ($p < .15$), these tests are notorious for low statistical power (Howell 1997). Daily life satisfaction was measured with one face-valid item, "how satisfied are you with your life?"; rated from 1 (not at all) to 7 (extremely). Daily life satisfaction had a corresponding correlation of .68 with the SWLS. Results suggest acceptable construct validity.

Daily pleasure

Daily pleasure was measured using two face-valid items to assess pleasure derived from food and sexual activity; rated from 1 (very slightly/not at all) to 5 (extremely).

Daily affect

Daily positive affect (proud, excited, enthusiastic, happy, and satisfied) and daily negative affect (anxious, afraid, angry, sad, and sluggish) were each measured with five adjectives; rated from 1 (very slightly/not at all) to 5 (extremely). Daily positive affect had a corresponding correlation of .48 with the trait PANAS-PA and daily negative affect was correlated .58 with the trait PANAS-NA.

Results

Descriptive statistics

We found mean scores of 34.88 ($SD = 6.52$) for the CEI, 23.29 ($SD = 6.57$) for the MLQ-presence, 23.95 ($SD = 6.26$) for the MLQ-search, 36.10 ($SD = 6.48$) for the PANAS-PA, 19.31 ($SD = 6.91$) for the PANAS-NA, 19.26 ($SD = 3.89$) for extraversion, 14.43 ($SD = 4.25$) for neuroticism, 19.95 ($SD = 2.81$) for openness, 21.62 ($SD = 2.65$) for agreeableness, and 19.67 ($SD = 3.42$) for conscientiousness. Psychometric properties of daily measures and correlations with trait scales are shown in Tables 1 and 2.

Overview of analytic techniques

The data were hierarchically structured with 1976 daily assessments nested within 97 people. Coefficients representing day level were estimated for each person (Level-1) and individual differences in these coefficients were estimated (Level-2). Level-1 variables were person-centered and Level-2 variables were grand-mean centered. We calculated the proportion of variance in Level-1 outcomes that were accounted for by primary predictors in our models (see Bryk and Raudenbush 1992; Singer 1998).

Trait curiosity as a moderator of how daily curiosity relates to daily well-being

We tested the prediction that on days when they are more curious, people with greater trait curiosity experience greater growth-oriented activity as measured by growth-oriented behaviors, presence of meaning, search for meaning, and life satisfaction (Fig. 1). To test the specificity of how trait curiosity is linked to well-being, we tested the prediction that on days when they experience more pleasure, less trait curious people experience more frequent hedonistic behaviors but not other forms of well-being (Fig. 2). To evaluate the construct specificity of trait curiosity, the Big Five personality traits were included as covariates. As an illustration, we modeled whether trait curiosity moderated relations between daily curiosity and growth-oriented behaviors.

Level-1 model: $y_{ij} = \beta_{0j} + \beta_{1j}(\text{daily curiosity}) + r_{ij}$

Level-2 model:

$$\begin{aligned}\beta_{0j} = {} & \gamma_{00} + \gamma_{01}(\text{CEI}) + \gamma_{02}(\text{openness}) \\ & + \gamma_{03}(\text{conscientiousness}) + \gamma_{04}(\text{extraversion}) \\ & + \gamma_{05}(\text{agreeableness}) + \gamma_{06}(\text{neuroticism}) + U_{1j} \\ \beta_{1j} = {} & \gamma_{10} + \gamma_{11}(\text{CEI}) + \gamma_{12}(\text{openness}) \\ & + \gamma_{13}(\text{conscientiousness}) + \gamma_{14} \\ & (\text{extraversion}) + \gamma_{15}(\text{agreeableness}) \\ & + \gamma_{16}(\text{neuroticism}) + U_{2j}\end{aligned}$$

In this model, at Level-1, y_{ij} is the frequency of growth-oriented behaviors (dependent variable) for participant j on day i, β_{1j} refers to the relation between daily curiosity and growth-oriented behaviors, and β_{2j} refers to the relation between daily curiosity and daily negative affect (covariate). At Level-2, γ_{01} through γ_{06} refers to the main effect of trait curiosity and each of the Big Five personality traits, and γ_{11} refers to cross-level interaction between trait curiosity and daily curiosity on daily growth-oriented behaviors; γ_{11} through γ_{16} refers to cross-level interactions with Big Five traits. As shown by the random error components (U_{1j} and U_{2j}), the intercepts and slopes were treated as random effects.

Table 2 Correlations between primary trait and daily measures

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. CEI	–															
2. MLQ-presence	.26**	–														
3. MLQ-search	.04	−.39***	–													
4. SWLS	.39***	.55***	−.38***	–												
5. Daily curiosity	.22*	.27**	−.03	.27**	–											
6. Growth behavior	.13	.40***	−.00	.20*	.11	–										
7. Hedonistic behavior	.10	−.08	.15	.01	−.12	.11	–									
8. Daily presence	.26**	.60***	−.34**	.58***	.40***	.34**	−.06	–								
9. Daily search	.12	.19	.27**	.00	.29**	.16	.07	.26**	–							
10. Daily life satisfaction	.31**	.52***	−.33**	.69	.32**	.28**	−.06	.89***	.14	–						
11. Daily pleasure	.12	.03	−.05	.07	.18	−.12	.30**	.23*	.07	.21*	–					
12. Openness	.39***	.26**	−.02	.23*	.13	.06	.03	.17	.09	.11	−.02	–				
13. Conscientious	.24*	.21*	−.15	.31**	.05	.15	−.25*	.31**	−.12	.34**	−.18	.14	–			
14. Extraversion	.36***	.32**	−.08	.40***	.08	.18	−.08	.28**	.03	.24*	.04	.18	.23*	–		
15. Agreeable	.10	.31**	−.07	.15	.15	.24*	−.19	.27**	.10	.24*	−.14	.11	.32**	.18	–	
16. Neuroticism	−.21*	−.29**	.22*	−.45***	−.09	−.11	−.03	−.25*	.06	−.33**	.05	−.09	−.13	−.15	.07	–

Notes: *$p < .05$; **$p < .01$; **$p < .001$. Correlations between trait and daily measures were calculated using the average of each daily measure

Growth-oriented pathway findings

On days when they felt more curious, people with greater trait curiosity reported more frequent growth-oriented behaviors, $B\gamma_{11} = .001$, $SE = .000$, $t(90) = 2.36$, $p = .02$, greater meaning in life, $B\gamma_{11} = .003$, $SE = .002$, $t(90) = 1.96$, $p = .05$, and greater life satisfaction, $B\gamma_{11} = .003$, $SE = .001$, $t(90) = 2.36$, $p = .02$; the cross-level interaction was non-significant for daily search for meaning. As shown in Fig. 3, significant interactions followed the pattern such that on days when they felt more curious, people high in trait curiosity reported substantially greater well-being than other people.

As for covariates, we also found evidence for Neuroticism × Daily Curiosity interactions in predicting presence of meaning, $B\gamma_{16} = .006$, $SE = .003$, $t(90) = 2.11$, $p = .04$, search for meaning, $B\gamma_{16} = .008$, $SE = .003$, $t(90) = 2.79$, $p = .007$, and life satisfaction, $B\gamma_{16} = .003$, $SE = .001$, $t(90) = 2.09$, $p = .04$. Each interaction followed the pattern such that on days when they felt more curious, people low in neuroticism reported greater well-being than other people. In predicting life satisfaction, there also was an Openness × Daily Curiosity interaction, $B\gamma_{12} = -.004$, $SE = .002$, $t(90) = -2.27$, $p = .03$, and Extraversion × Daily Curiosity interaction, $B\gamma_{14} = -.004$, $SE = .001$, $t(90) = -2.75$, $p = .008$. Upon examining these interactions, on days when they felt more curious, people low in openness showed greater life satisfaction than other people; on days they felt less curious, people low in extraversion showed the least life satisfaction.

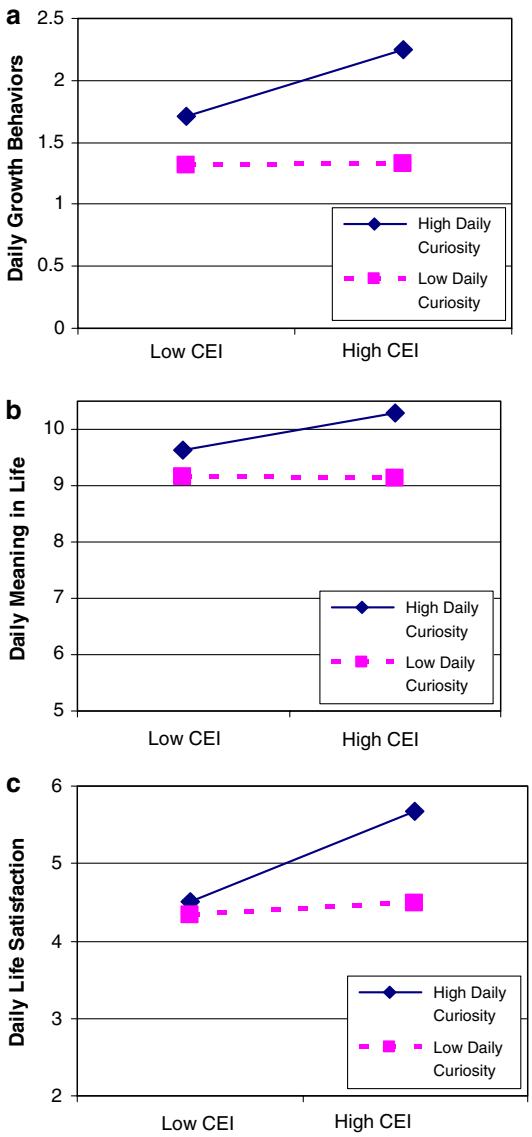

Fig. 3 Trait curiosity moderating daily curiosity on daily (**a**) growth-oriented behaviors, (**b**) presence of meaning in life, and (**c**) life satisfaction. *Notes:* Daily predictors were person-centered and trait curiosity was grand-mean centered. Each of the Big Five trait dimensions was included as covariates predicting intercepts and daily curiosity slopes. Data were plotted using the full range of the CEI and the 25th and 75th percentiles for daily curiosity

Hedonistic pathway findings

In these models, daily pleasure replaced daily curiosity as a predictor (β_{1j}). There was support for a Trait Curiosity × Daily Pleasure interaction, $B\gamma_{11} = -.01$, $SE = .003$, $t(90) = -3.23$, $p = .002$, such that for people low in trait curiosity, highly frequent hedonistic behaviors were only present on days when they felt more pleasure. On average, people high in trait curiosity reported highly frequent hedonistic behaviors. This interaction is shown in Fig. 4. Daily pleasure also predicted greater daily presence of meaning, $B = .18$, $SE = .04$, $t(90) = 4.48$, $p < .001$, search for meaning, $B = .17$, $SE = .04$, $t(90) = 4.06$, $p < .001$,

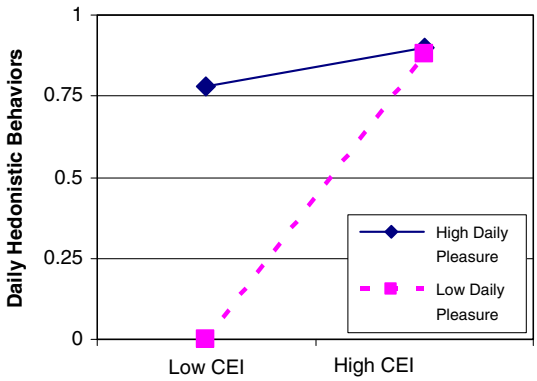

Fig. 4 Trait curiosity moderating daily pleasure on daily hedonistic behaviors. *Notes:* Daily predictors were person-centered and trait curiosity was grand-mean centered. Each of the Big Five trait dimensions was included as covariates predicting intercepts and daily pleasure slopes. Data were plotted using the full range of the CEI and the 25th and 75th percentiles for daily pleasure

and life satisfaction, $B = .09$, $SE = .02$, $t(90) = 4.68$, $p < .001$. No other effects for curiosity and daily pleasure were significant.

As for covariates, we found evidence for Neuroticism × Daily Pleasure interactions in predicting presence of meaning, $B\gamma_{16} = .02$, $SE = .01$,$t(90) = 2.39$, $p = .02$, search for meaning, $B\gamma_{16} = .03$, $SE = .01$, $t(90) = 2.85$, $p = .006$, and life satisfaction, $B\gamma_{16} = .01$, $SE = .01$, $t(90) = 2.34$, $p = .02$, such people high in neuroticism reported low meaning on days when they felt more pleasure; people low in neuroticism reported high meaning on days when they felt more pleasure. No other covariates were significant.

Summary

Supporting our growth-oriented model, on days when people felt particularly curious, people with greater trait curiosity engaged in more frequent growth-oriented behaviors and experienced greater presence of meaning in life and life satisfaction. Effects were not attributable to Big Five traits, including a series of relations showing that people low in neuroticism reporting high levels of curiosity on a given day, report substantial well-being. Supporting our hedonistic model, people with high trait curiosity report frequent hedonistic behaviors but the well-being of less trait curious people are dependent on the amount of pleasure experienced on a given day. Interestingly, on the same day, the amount of experienced pleasure was positively associated with meaning in life and life satisfaction.

Curiosity predicting high and enduring daily meaning in life and life satisfaction

We can infer temporal sequences in the predicted relation between curiosity and well-being by examining carry-over effects into sequential days. As the final sequence of our model, greater daily curiosity was expected to predict greater meaning in life, search for meaning, and life satisfaction that carry-over into subsequent days. These relations were expected to be more pronounced in people high in trait curiosity. In contrast, the benefits of daily pleasure on well-being were expected to be short-lived, failing to persist into the next day. Using time-lag analyses to assess change, we conducted separate models for three downstream daily well-being outcomes: meaning in life, search for meaning, and life satisfaction. We predicted each outcome from the prior day's score, prior day's daily curiosity (growth-oriented model), and prior day's daily pleasure (hedonistic model). Covariates included the prior day's positive and negative affect. As an illustration, we modeled whether trait curiosity moderated the influence of daily curiosity on the persistence of daily meaning in life into the next day.

Level-1 model:

$$y_{ij} = \beta_{0j} + \beta_{1j}\,(\text{daily meaning in life}_{i-1}) + \beta_{2j}\,(\text{daily curiosity}_{i-1}) + \beta_{3j}\,(\text{daily positive}_{i-1}) \text{ affect} + \beta_{3j}\,(\text{daily negative affect}_{i-1}) + r_{ij}$$

Level-2 model:

$$\begin{aligned} \beta_{0j} &= \gamma_{00} + \gamma_{01}\,(\text{CEI}) + U_{1j} \\ \beta_{1j} &= \gamma_{10} + U_{2j} \\ \beta_{2j} &= \gamma_{20} + \gamma_{21}\,(\text{CEI}) + U_{2j} \\ \beta_{3j} &= \gamma_{30} + \gamma_{31}\,(\text{CEI}) + U_{2j} \\ \beta_{4j} &= \gamma_{40} + \gamma_{41}\,(\text{CEI}) + U_{2j} \end{aligned}$$

In this model, at Level-1, y_{ij} is the daily meaning in life (dependent variable) for participant j on day i, β_{1j} through β_{3j} refers to the prior day's meaning in life (allowing us to examine change in meaning over time), curiosity, positive and negative affect. At Level-2, γ_{01} refers to the trait curiosity main effect and γ_{21} through γ_{41} refers to trait curiosity as a moderator of the effects of daily curiosity, positive affect, and negative affect, respectively.

Growth-oriented pathway findings

After accounting for the prior day's presence of meaning, greater daily curiosity led to greater presence of meaning the next day, $B = .02$, $SE = .01$, $t(95) = 2.33$, $p = .02$, and greater trait curiosity led to greater presence of meaning the next day, $B\gamma_{01} = .07$, $SE = .04$, $t(95) = 1.91$, $p = .06$. The only other significant effect found greater daily NA leading to less presence of meaning the next day, $B = -.05$, $SE = .02$, $t(95) = -3.09$, $p = .003$.

After accounting for the prior day's search for meaning, greater daily curiosity led to greater search for meaning the next day, $B = .02$, $SE = .01$, $t(95) = 1.74$, $p = .08$, and there was marginal support for greater trait curiosity leading to greater search for meaning the next day, $B\gamma_{01} = .07$, $SE = .04$, $t(95) = 1.62$, $p = .11$; there were no significant cross-level interactions or covariate effects.

After accounting for the prior day's life satisfaction, greater trait curiosity led to greater life satisfaction the next day, $B\gamma_{01} = .05$, $SE = .02$, $t(95) = 2.29$, $p = .02$; there was no significant main effect or cross-level interaction with daily curiosity. The only significant covariate found greater daily NA leading to less life satisfaction the next day, $B = -.02$, $SE = .01$, $t(95) = -2.47$, $p = .02$.

Upon testing the reverse direction of relations between daily curiosity and daily meaning, there was no evidence

that daily presence of or search for meaning predicted persistence in daily curiosity.

Hedonistic pathway findings

In these models, all predictors were the same as the equations above except that daily pleasure replaced daily curiosity (β_{2j}). Daily pleasure did not predict day-to-day changes in the presence of meaning or life satisfaction. However, greater daily pleasure led to less search for meaning from one day to the next, $B = -.07$, $SE = .03$, $t(95) = -2.15$, $p = .03$.

Summary

Greater curiosity on a given day, and greater trait curiosity, both led to greater meaning in life and the continued intentional search for meaning from one day to the next. Greater trait curiosity also led to greater life satisfaction from one day to the next. These effects could not be accounted for by the amount of positive and negative affect on a given day. Greater daily negative affect independently predicted less persistence of meaning and life satisfaction. Our model only operated in one direction as greater meaning failed to predict changes in daily curiosity. Finally, while daily pleasure had benefits on the day of occurrence (see prior section), these benefits did not carry over into the subsequent day. In fact, greater daily pleasure predicted less search for meaning over time.

Discussion

Our primary goal was to evaluate whether curiosity is a viable mechanism in the short-term sustainability of well-being. To address this goal, we examined how trait and daily curiosity work together in predicting well-being and meaningfulness in everyday life. Supporting a behavioral congruence model (Côté and Moskowitz 1998), people high in trait curiosity reported more frequent growth-oriented behaviors and extracted greater meaning and life satisfaction on days when they experienced greater curiosity. Both greater trait and daily curiosity led to greater presence of and search for meaning in life that persisted into the next day. In comparison, daily pleasure was rewarding for a much briefer time span.

As evidence of construct specificity, the effects of curiosity could not be attributed to Big Five traits or daily positive or negative affect. These tests were conservative as a number of covariates related to well-being. For example, the combination of low neuroticism and high curiosity on a given day consistently predicted greater well-being on the same day and greater daily negative affect consistently predicted declining well-being from one day to the next. Overall, trait and daily curiosity, separately and in tandem, contribute to the development and sustainability of meaningful living. Whereas daily curiosity predicted high, sustainable meaning in life, there was no support for the reverse direction.

Curiosity as an ingredient in the pursuit of pleasurable and meaningful living

Several researchers argue that the optimal states of psychological functioning are intrinsic motivation (Ryan and Deci 2000), interest (Sansone and Smith 2000), and flow (Csikszentmihalyi 1990), which overlap considerably with curiosity. This work highlights the importance of examining whether people with a predisposition to curiosity experience and maintain the elements of satisfying, engaging, and meaningful living. We found support for the benefits of being high in trait curiosity and demonstrated that these effects were not reducible to global positive traits or positive or negative mood states (see Kashdan et al. 2004; Kashdan and Roberts 2004 for similar findings). Yet, our findings went beyond how curiosity relates to mean levels of growth-oriented behaviors and well-being. We found that people with greater trait curiosity are particularly sensitive to the rewards of being in a curious mood.

We found a distinct path with trait curiosity moderating everyday curiosity to predict well-being and meaning in life on a given day, and greater curiosity on a given day predicting persistent elevations in meaning in life over time. Unlike pleasure, joy, and related emotions which function to strengthen previously existing relationships, curiosity has a distinct function to motivate exploration of the self and world, and expand knowledge and skills (Tomkins 1962; Turner and Silvia 2006). Sustainable increases in well-being may be better attained by seeking novelty and challenge as opposed to focusing on pleasure and stability.

The benefits of being higher in trait curiosity are proposed to stem from: (a) the willingness to choose activities that stretch and develop skills and potential and (b) greater tendencies to be approach (and not avoidance) oriented when confronted with novel, uncertain, and complex activities. Avoidance behaviors are negatively reinforcing because they reduce unwanted distress. Yet, the consequences of unsatisfied, residual curiosity include missed opportunities, regret, and other undesirable outcomes. How people respond to anxiety-provoking appetitive contingencies remains an important area of research to understand how positive traits and states such as curiosity

are linked to well-being. Perhaps the exploration of difficult, challenging, and complex situations is a paradoxical route to greater meaning in life, and curiosity serves as one of the motivational engines. The exercise of strengths in challenging situations may be a potent route to better understand one's competence to master the environment and contribute in meaningful ways to the world beyond the self (Baumeister 1991).

In contrast to predictions that curiosity would be specifically linked to growth-oriented processes, a competing hypothesis is that curiosity is relevant to most rewarding activity. Curiosity has been defined as a core motivational mechanism of the biologically-based behavioral approach system (Depue 1996). People with stronger approach systems feel happier after being rewarded for success in lab-based tasks (Carver and White 1994) and greater reactivity to everyday positive events in terms of greater positive emotions (Gable et al. 2000). Based on the role of curiosity in this approach system, it could be argued that people with greater trait curiosity demonstrate reactivity to most rewarding stimuli including hedonistic behaviors. Our data suggest that curiosity has particularly strong associations with novelty and growth potential as opposed to indiscriminate sensitivity to positively valenced stimuli.

Re-examining different types of well-being

Contrary to predictions, we failed to find support for some of the distinctions between hedonic and eudaimonic well-being. Hedonic well-being is supposedly circumscribed to the pursuit of pleasure and avoidance of pain (affect balance) and life satisfaction judgments. Eudaimonia supposedly captures broader components of the good life such as striving to be authentic, developing one's growth potential, and possessing concerns that extend beyond the self (e.g., Ryan and Deci 2001). The empirical support for two qualitatively distinct categories is largely based on factor analytic findings (e.g., Keyes et al. 2002; Ryff and Keyes 1995) and comparing narrow well-being indicators (such as personal expressiveness versus joy on the same outcomes; Waterman 1993). However, the presence of two factors does not indicate distinct categories. Also, it may be erroneous to define positive affect, pleasure, and negative affect as separate in kind from the process of pursuing personal growth and meaning in life.

Positive affect, defined as part of hedonic (but not eudaimonic) well-being, has been shown to influence the process of detecting and constructing meaning in life, which is defined as part of eudaimonic (but not hedonic) well-being (King et al. 2006; Tugade and Fredrickson 2004). In the current study, we found more intense pleasure on a given day to be associated both with a greater frequency of hedonistic behaviors (hedonic dimension) and greater presence of and search for meaning in life (eudaimonic dimension). Additionally, greater daily curiosity, characteristic of optimal functioning and personal growth (Csikszentmihalyi 1990; Ryan and Deci 2000), was associated with high frequencies of both growth-oriented and hedonistic behaviors on a given day. In our work, the factors that best distinguished daily curiosity and pleasure were the longevity of effects and how trait curiosity influenced sensitivities to these experiences. Given these distinguishable patterns, addressing temporality and theoretically relevant moderating variables appears promising to understand the nature of different and interlocking facets of well-being.

Holding firm to two competing types of well-being can obstruct science, particularly when common outcomes of interest seem to be achieved through both routes. For example, we know that people find meaning, develop stronger relationships with others, and grow and expand as a person in the context of stress, trauma, and negative feelings (Tedeschi et al. 1998); they also appear to develop similar outcomes in the context of positive feelings (Folkman and Moskowitz 2000). Hedonic and eudaimonic well-being may be better described by their precise, often overlapping, constituent parts. If we are interested in personal growth or positive relationships or self-compassion or positive emotions or hedonism, then it is sensible to discuss, measure, and study these specific social-cognitive processes. Further, it appears that the same variable can be related to divergent outcomes depending on contextual factors. The search for meaning is associated with fairly negative variables when it is measured as a trait (e.g., Steger et al. 2006) and when it persists in the wake of trauma (e.g., Davis et al. 2000); in the present study, short-term searching for meaning in the context of everyday life was clearly related to positive outcomes. In sum, pleasurable states are relevant to searching and finding meaning in life, curiosity is relevant to hedonistic pursuits, and the similarities between hedonic and eudaimonic well-being traditions appear to overshadow any differences.[3]

In terms of specific facets of well-being, growth-oriented activity (including curiosity) is not inherently better or worse than hedonistic activity. Context and function are as important as content. If people seek to self-regulate by boosting positive or reducing negative affect, hedonistic activity could suffice. After all, greater sensory pleasure on a given day was associated with greater presence of meaning, search for meaning, and life satisfaction on the same day. However, if a persons' goal is to live a more engaging and meaningful life (e.g., being more authentic in

[3] We thank Robert Biswas-Diener and Laura King for conversations that stimulated many of these ideas.

social interactions, expressing feelings more openly, working to maximize potential at work), then it is more useful to selectively pursue growth-oriented activities. In our study, greater sensory pleasure failed to predict high, sustainable well-being; in some cases, it predicted reduced well-being over time. Sometimes people seek to expand themselves, other times people prefer to consolidate their experiences and feel a sense of stability, and people differ in their tolerance and enjoyment of ambiguity and effortful activity. Self-awareness of personal values, and how and when to focus on growth or hedonistic processes, may be essential to lasting well-being. Other skills that might contribute to lasting well-being include the ability to (a) self-select activities that fit short- and long-term goals and (b) flexibly adapt regulatory strategies to situational demands. Future work should examine how these emotionally intelligent skills fit within the models outlined.

Study limitations

Despite promising initial findings, causality can only be addressed by manipulating these psychological mechanisms in laboratory experiments. This includes further consideration of the processes that link everyday curiosity to meaningful living. Some suggested processes linking daily curiosity to greater meaning in life include the cultivation of knowledge and skills, feelings of competence or self-efficacy, an enriched understanding of which activities to invest in to generate curiosity, the transformation of momentary curiosity into preserved interests, persistence in personally valued goals, or some combination of these and other mechanisms (Lent et al. 1994; Sansone and Smith 2000; Silvia 2001). This study was meant to be an initial exploration of how curiosity leads to well-being and thus, it will be prudent to examine a broader set of mechanisms (e.g., choices, behaviors, appraisals, environments) that differentially contribute to meaning in life.

Although our daily diary approach is an improvement over static studies of curiosity and well-being, there are interpretative caveats. Our paper-and-pencil methodology afforded an extremely liberal evaluation of participant compliance. In fact, our impressive response rate may reflect a subset of participants completing batches of daily reports in a single setting as opposed to the end of each individual day. Nonetheless, prior work suggests that findings with our approach tend to be comparable to results found with more sophisticated electronic diary and web-based survey designs with built-in time- and date-stamping (Green et al. 2006).

As mentioned in the introduction, our hedonistic model was not the most appropriate examination of "hedonic well-being." The items used were reflective of a small subset of hedonistic pursuits that did not capture more socially desirable and pleasant activities (e.g., getting a massage, playing with pets, relaxing strolls). Additionally, our use of more objective and less common hedonistic behaviors partially compromised comparisons between the hedonistic and growth-oriented pathways. Also, the daily behavior checklist was circumscribed to a small number of items (to reduce participant burden) and our measure of daily sensory pleasure narrowly reflected the domains of sex and food. While these measures should not be over-interpreted, this is a useful entry point into an understudied area (Steger et al., in press b). Future work can expand the depth, breadth, and precision of our measurement strategy. Also, the findings may not generalize beyond college-aged people. Future work should cross-validate these findings with alternative samples (e.g., different age groups, clinical samples) and non-self-report technologies (e.g., information-processing measures of curiosity; Ainley and Hidi 2002). In addition, more work is needed on identifying the resources curiosity builds (e.g., physical, interpersonal, intellectual) and relevant antecedent and causal mechanisms (e.g., appraisals of novelty and self-efficacy; perceptions of threat and challenge; task and competence valuation). Finally, although we focused on changes in well-being from one day to the next, research on curiosity and other predictors of well-being needs to broaden the timeline of assessment beyond days to weeks, months, and years.

Conclusion

In summary, our data show that trait and daily curiosity are important processes in the development and persistence of well-being. Despite factors that work against the development of increased well-being (e.g., Brickman and Campbell 1971), effortful goal-oriented activity congruent with a person's core values may disrupt these stabilizing processes (Lyubomirsky et al. 2005; Wilson and Murrell 2004). The disposition and state most aligned with these activities could be curiosity. People with greater curiosity challenge their views of self, others, and the world with an inevitable stretching of information, knowledge, and skills. An open, exploratory orientation to everyday activity appears to be a pathway to the continual building of meaning in life, with the simultaneous existence of a positive present (presence of meaning) and future (search for meaning) time orientation. Supporting its recent inclusion in a taxonomy of character strengths (Peterson and Seligman 2004), people scoring high in trait curiosity experienced a number of life fulfillments. Our research suggests that curiosity is an important, neglected process in the pursuit of a life well lived.

Acknowledgments This research was supported by National Institute of Mental Health grant MH-73937 to Todd B. Kashdan. Portions of this article were presented at the 2005 International Positive Psychology Summit. We are grateful to Paul Silvia and Thomas G. Reio, Jr. for their comments and suggestions.

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