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How experiencing autonomy contributes to a good life

Atsushi Kukita, Jeanne Nakamura and Mihaly Csikszentmihalyi

Department of Psychology, Claremont Graduate University, Claremont, CA, USA

ABSTRACT

To discern what accounts for moment-to-moment fluctuations in well-being, the present study investigated how state-level autonomy relates to three aspects of well-being: affect, engagement, and meaning measured at the momentary level using the experience sampling method (ESM). These effects were contrasted with the impact of activity types (work, study, play, rest), controlling for life satisfaction and demographic differences, using multilevel regression analyses. Controlling for all other predictors, autonomy was the only significant predictor for momentary affect and engagement; it was the strongest predictor for momentary meaningfulness. Autonomy showed a positive linear relationship in predicting affect, whereas the relationship was quadratic for the remaining two aspects of well-being such that engagement and meaning increase as autonomy rises from none, low, to moderate levels but plateau from moderate to high autonomy. Results suggest that beyond what people do, a key to well-being may be experiencing higher autonomy without necessarily eliminating extrinsic motivation.

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Autonomy; affect; engagement; meaning; well-being; experience sampling method (ESM); multilevel modeling (MLM)

Whereas the level of well-being varies among people, it also fluctuates within each individual (Csikszentmihalyi et al., 2014; Csikszentmihalyi & Wong, 1991; Delle Fave et al., 2011; Diener et al., 2018; Kahneman et al., 2004; Möwisch et al., 2018; Reis et al., 2000; Sheldon et al., 1996). Although not as widely researched as differences of well-being between individuals, evidence accumulates that variations of well-being within the same individual occur both at the macro level, such as across major lifespan periods or life domains (e.g., Benson et al., 2019; Carstensen et al., 2011; Kim-Prieto et al., 2005), as well as at the micro level, where notable within-individual fluctuations are reported across days, hours, or even seconds (e.g., Choi et al., 2016; Hektner et al., 2007; Reis et al., 2000; Sheldon et al., 1996). To better understand what good life and well-being entail, research needs to complement the trait-level and macro-level approaches by examining what might characterize and account for those micro-level fluctuations. Because they are spontaneously experienced and only transiently measurable, it is crucial to capture and explain such fluctuations of well-being and their correlates as they occur in real life (Csikszentmihalyi & Hunter, 2003; Scollon et al., 2003).

Among many factors that can contribute to explaining if and to what extent people experience happiness at a given moment, the type of activities people engage in is shown to saliently account for these fluctuations, ranging, for example, from being at work or school, to eating or relaxing, to playing or socializing, just to name a few (Csikszentmihalyi & Hunter, 2003; Csikszentmihalyi & LeFevre, 1989; Csikszentmihalyi & Wong, 1991). Csikszentmihalyi and colleagues have condensed a long list of what comprises human activities into the following three major components: (1) productive activities including work for adults and study for students, (2) maintenance activities such as eating and cleaning, and (3) leisure activities in both active and passive forms, and found that all three components differentially predict happiness in the moment, such that, for instance, work (i.e., productive activity) more prevalently accompanies lower levels of happiness than leisure activities (Csikszentmihalyi, 1997; Csikszentmihalyi & Graef, 1980; Hektner et al., 2007). Whereas the comparison of happiness between work and non-work is popularly investigated (e.g., Biskup et al., 2019), the category for non-work has tended to encompass a broad range of activities, for example, from relaxing, playing, to studying, which could all potentially have different influences on one's level of happiness. There are studies, albeit rare, that have compared happiness between work and, more specifically, leisure activities (e.g., Haworth & Lewis, 2005). However, a cross-component examination that incorporates a wider variety of everyday activities simultaneously is still necessary to more fully understand well-being.

In addition to the types of activities people take part in, the motivations behind engaging in such activities

CONTACT Atsushi Kukita atsushi.kukita@cgu.edu

have also been linked to the varying degrees of moment-to-moment well-being outcomes. Specifically, intrinsically motivated experiences are often reported to accompany higher levels of happiness than extrinsically motivated activities as measured in the moment (Csikszentmihalyi, 1975; Csikszentmihalyi & Nakamura, 2014; Graef et al., 1983). Influential in intrinsic motivation literature, Ryan and Deci (e.g., 2000; Ryan, Deci et al., 2006) introduce a continuum of autonomous versus controlled motivational regulations to bridge the two ends of intrinsic and extrinsic motivations. They note that whereas intrinsic motivation is always more desired, most motivational accounts in real life situations are at least somewhat extrinsic, and that even extrinsically motivated activities can contribute to enhanced well-being as the level of autonomous motivation increases (Deci & Ryan, 2000; Ryan & Deci, 2006; Ryan, Deci et al., 2006; Reis et al., 2000; Sheldon et al., 1996).

Thus, both what people do from moment to moment and why they do it have been shown, separately, to count towards momentary happiness. However, the relative contribution of the 'what' as opposed to the 'why' require further investigation. Informing this inquiry, Ryan et al. (2010) have reported that an observed pattern of work-related activities accompanying lower momentary mood than non-work activities may be fully mediated by the amount of autonomy behind these activities, evidencing that autonomous motivation may better explain momentary well-being, more so than the type of activity that one engages in. Nevertheless, subsequent research by Stone et al. (2012) partially questioned the result of autonomy fully mediating the affect by observing competing factors such as weekend effect still remaining significant after controlling for autonomy.

Findings from the abovementioned studies (Ryan et al., 2010; Stone et al., 2012) are also restricted to the construct of affect (see Diener & Emmons, 1984) for their operationalization of momentary well-being. For well-being is not a unidimensional construct, coming investigations would benefit from incorporating broader, multifaceted definitions for a more comprehensive understanding of well-being. Psychological research on well-being has often contrasted hedonic (Diener, 1984; Kahneman et al., 1999) and eudaimonic (Ryan & Deci, 2000; Ryan, Huta et al., 2006; Ryff, 1989; Ryff & Singer, 2008) approaches to happiness and good life (e.g., Delle Fave, 2013; Thorsteinsen & Vittersø, 2019; Waterman et al., 2008). Arguably, distinguishing between the two approaches too sharply and debating over which approach better conceptualizes well-being brought a rather costly divide that slowed collaborations in well-being research (Kashdan et al., 2008). Instead, researchers need to promote collaboration by examining the relationship across the multiple, well-operationalized constructs that exist between the two ends of the dualism to better understand well-being.

Among such efforts to synthesize the two approaches, Peterson et al. (2005) have proposed and empirically supported that affect (hedonic pleasure), meaning (eudaimonia), and engagement (flow) can be seen as three distinct yet essential aspects of well-being that work together to define the varying ways individuals pursue good life. Originally proposed as trait-level orientations or differing tendencies in individual preferences, these dimensions also well account for state-level, momentary happiness. In light of this, it would be thus important to examine not only whether the 'what' or 'why' about the activity matter more in influencing momentary well-being, but also whether it matters more depending on different aspects of well-being such as affect, meaning, and engagement.

Whereas no investigations have included all these aspects to allow for direct comparisons, Bassi and Delle Fave (2011) have focused on students' optimal engagement (flow) at the momentary level and investigated its linkage with autonomous motivation (i.e., the 'why') during school activities by adopting self-determination theory's concept of autonomy (e.g., Ryan & Deci, 2000), intriguingly finding that experiential outcomes such as happiness level were greater in activities with moderate and high autonomy than low autonomy. Interestingly, they also found that activities with moderate autonomy yielded greater involvement than either high or low levels of autonomy. These results were somewhat contrary to previous literature that simply predicted a positive linear pattern such that the higher the autonomy, the greater the outcome. Rather, their findings suggest that the association between autonomy and momentary well-being reflects a nuanced quadratic relationship, necessitating further investigation.

Taking these findings from Bassi and Delle Fave (2011) and those from Ryan et al. (2010), it could then be inferred that autonomy commonly relates to momentary well-being but with sharply contrasting patterns depending on whether well-being is defined as *affect* (Ryan et al., 2010) as opposed to *engagement* (Bassi & Delle Fave, 2011). In addition to replicating these emerging pieces of evidence, investigating how autonomy relates to *meaning*, the third aspect of well-being mentioned earlier, would complement these results. Likewise, how autonomous motivation (i.e., the 'why') compares to situational differences (i.e., the 'what') in explaining these aspects of well-being (affect, meaning, and engagement) remains unanswered and awaits a thorough examination.

Present study

Joining the abovementioned perspectives and bridging these emerging pieces of evidence, the present study investigated the relative strength of both situational (i.e., activity) and motivational (i.e., autonomy) factors in predicting state-level well-being on the three aspects of momentary affect, meaning, and engagement. For lack of clear theoretical justifications in formulating directional hypotheses, the present study investigated its objectives in the form of research questions detailed below. Further, owing to the experience sampling method (ESM) that helps collect data of momentary instances nested under individuals, from which multilevel modeling analyses allow for separating moment-level effects from individual-level ones, demographic information and general life satisfaction levels were also examined to potentially account for individual differences (e.g., Ryan et al., 2010; Sheldon et al., 1996).

Research questions

(1) How strongly does the type of activity (i.e., work, study, play, versus rest) relate to the three aspects of well-being (i.e., affect, engagement, and meaning) measured at the state level within each person?
(2) How strongly does the perceived level of autonomy during each experience relate to momentary affect, engagement, and meaning within each person? Further, for each well-being measure, is the association with autonomy best captured as a linear or higher-order relationship?
(3) When autonomy and activity type are examined together, what is their relative strength as contributors to momentary affect, engagement, and meaning; and further, do autonomy and activity type interact with each other?
(4) How does the above addressed relationship vary across individuals, if at all, based on general person-level (demographic) covariates of age, gender, educational background, and overall trait-level life satisfaction level?

Method

Participants and design

The present study utilized the experience sampling method (ESM) via a smartphone-based platform called Personal Analytics Companion (PACO; e.g., Evans, 2016). As PACO runs on Android and iOS smartphone devices, participation was limited to individuals who used either an Android or an iPhone. Participants were recruited via online social networks and word of mouth and were enrolled in their seven-day participation period on a rolling basis (i.e. participants did not all start and end on the same dates but instead started their seven-day period on a date convenient to them). Based on past experiences with similar studies, this rolling participation approach helps increase participation rates and decrease attrition. Participation was entirely voluntary, and a 20 USD incentive for full participation in all aspects of the study was provided as compensation to all eligible participants at the completion of the study. Also upon completion, an informational summary of the results was offered to any interested participants.

Of the initial set of individuals who indicated their interests in participation ($N = 75$), about 97% joined the ESM portion of the study and provided responses to signals ($N = 73$); and about 91% participated in all phases of the study ($N = 68$). The participants in the full study (38 women, 30 men, $M_{age} = 31.12$ years, age range: 18–74) consisted primarily of working professionals and full-time students. Regarding the highest level of education completed, 47% of participants held a college degree, 28% held a master's degree (i.e., MBA, MA, MSW, etc.), 4% a professional degree (i.e., MD, PhD, JD, etc.), 15% had completed 'some college,' and 6% had completed 'high school or less.' For race/ethnicity, 59% identified as Caucasian, 17% as Asian/Pacific Islander, 7% as Hispanic, 7% as Black/African American, 4% as Native American/Alaska Native and 7% as Other/Multi-racial. For political affiliations, 45% identified as Democrat, 21% as Republican, 7% as Independent, 3% as Other, and 24% did not identify with any political affiliation. For religious beliefs, 40% of participants identified as Christian, 6% as Jewish, 1% as Muslim, 6% as Buddhist, 7% as Atheist, 25% as Agnostic, and 15% as Other.

Procedure

The study design called for individuals to be signaled via PACO six times a day for 7 days between the hours of 8 am and 10 pm. The signals were sent to participants with randomized time intervals during these hours for them to answer a set of questions regarding their experience of the specific moment of the signal using an experience sampling form (ESF). There were times when participants were unable to respond to signals, were unaware that they were being signaled, forgot their devices, or PACO had malfunctioned. Some participants chose to participate for slightly longer than 7 days. The completion rate and response rate are reported below in the results section. Training sessions were conducted to familiarize participants with operating the PACO application on their mobile devices either through an in-person

consultation or over the telephone by a member from the research team. Finally, following the completion of the 7 days of participation, individuals were given a link to complete a survey on Qualtrics that would provide additional information about demographic variables and other personality measures. A total of 68 individuals completed the final survey.

Measures

Of the following items, the first five (i.e., Autonomy, Activity Type, Affect, Engagement, and Meaningfulness) were asked in the ESF questionnaire, where participants were signaled to report their perceived levels of each measure at the moment of the signaling.

Autonomy

At each sampled moment, participants were prompted to report the level of autonomous motivation at the moment they were signaled by responding to the question: 'Why were you doing this activity?' with one of the four answer options: 'There was nothing else to do,' 'I had to,' 'I both had to and wanted to,' and 'I wanted to.' Numerical scales from one through four were assigned to these selections in this respective order so that greater values represented higher degrees of autonomous motivation. Although a full measure of autonomous motivation would require an extensive list of items (e.g., as used in Ryan et al., 2010; Ryan & Connell, 1989), his simplified approach to the level of autonomous motivation was introduced and used by Bassi and Delle Fave (2011).

It is important to note that Bassi and Delle Fave (2011) treated this item as a categorical variable in their analyses, although they clearly indicated an intention of investigating the degree of autonomy from low, moderate, to high levels on the theoretical continuum as proposed by Ryan and Deci (2000) and interpreted it as conceptually ordinal. Reflecting both theoretical and empirical support for understanding autonomy on a continuum (Ryan & Connell, 1989; Ryan & Deci, 2000; Ryan, Deci et al., 2006), the present study assigned a numerical scale to this variable and treated it as continuous, exploring an alternative analytic approach, whose utility and justifiability are discussed later. Further, the response of 'there was nothing else to do' was excluded in Bassi and Delle Fave (2011) as it was considered amotivation or a lack of autonomous regulation. Results both with and without this option were compared in this study but virtually no difference was observed. Consequently, the models including this response option were reported in the results section to present fuller context and help with interpretability.

Activity type

Participants were asked to classify what they were doing at the signaled moment by answering the question: 'How would you classify what you were doing?' from five check-all-that-apply options: 'Work or productive activity,' 'Study or learning activity,' 'Playful or lighthearted activity,' 'Relaxation or restful activity,' and 'None of the above.' Although both 'work' and 'study' would be considered as the productive activity component in Csikszentmihalyi's (e.g., 1997) taxonomy mentioned earlier, these two were separately assessed to capture potential differences between the two activity types, especially considering that the present study involved high proportions of both working professionals and students in its sample. The 'playful' option represented the active leisure component, while the 'restful' reflected the passive leisure component. Since the 'none of the above' option was not a specific type of activity, this response was excluded from the analyses.

Affect

Participants were asked to assess their affective state of the positive versus negative mood at the signaled moment with a single item question 'What was your mood?' using a 7-point scale that ranged from 1 (*very negative*) to 7 (*very positive*).

Engagement

Participants were also asked to indicate their perceived extent of engagement in the activity with a single item question 'How engaged in the activity did you feel?' using a 7-point scale that ranged from 1 (*not at all*) to 7 (*extremely*).

Meaningfulness

Finally, participants were asked to report the extent to which they found the activity at hand meaningful with a single item question 'How meaningful was the activity that you were doing?' on a 7-point scale that ranged from 1 (*not at all*) to 7 (*extremely*).

Satisfaction with life

In the end-of-week exit-survey questionnaire, participants were asked to complete the 5-item Satisfaction with Life Scale (Diener et al., 1985). Specifically, participants rated the extent to which they agreed with five statements regarding their general life satisfaction such as 'In most ways my life is close to my ideal' using a 7-point scale that ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). Responses to these five items were aggregated for each participant as a single score life satisfaction measurement.

Results

Of the 73 individuals who initially joined the study, 68 of them validly sustained their participation through all phases of the study, which led to a 93% participation rate. Among these participants, a 90% compliance rate was achieved with 2,575 valid responses out of 2,856 possible signals (68 participants x 6 signals x 7 days). In order to answer each research question outlined earlier, a series of multilevel multiple regression analyses were performed.

Predicting momentary affect

Intraclass correlation (ICC) calculated for the dependent variable of affect indicated that 20% of the variability in affect was attributable to individual differences, which warranted the preference of a multilevel analysis to a single-level regression. Following this, a series of multilevel multiple regression analyses was conducted by regressing the momentary affect (measured on a positive-negative continuum) on autonomous motivation towards the activity while controlling for the activity types at the momentary level (level 1) and controlling for age, gender, educational level, and general life satisfaction at the person level (level 2).

Results from the final model are presented in Table 1. In the initial model, only the activity categories were tested, all of which showed significant main effects with the 'rest' category being the reference group (Work: $B = -0.257$, $t = -4.34$, $p < .001$; Study: $B = -0.279$, $t = -2.29$, $p = .022$; Play: $B = 0.639$, $t = 7.65$, $p < .001$); these significant effects however all disappeared once the autonomy measure was added to the model. Observing that the autonomy in the activity indicated a significant positive linear relationship to the affect as a main effect ($B = 0.357$, $t = 3.35$, $p = .001$), its quadratic term was further tested in the model. The quadratic effect was non-significant and was therefore removed from the final model. Interactions between autonomy and activity type were also tested, which also showed no significant effects. None of the person-level controls were significant. Figure 1 presents the predicted patterns of affect based on different levels of autonomy and types of activities according to the final model.

Table 1. Momentary Affect Regressed on Autonomy, Activity Type, and Person-level Controls.

	Activity-Only Model			*Full (Final) Model*		
	B	*SE*	*t*	*B*	*SE*	*t*
Intercept	*4.87*	*0.080*	*60.92****	*2.95*	*0.620*	*4.75****
Activity: Work	*−0.257*	*0.059*	*−4.34****	*0.157*	*0.421*	*0.372*
Activity: Study	*−0.279*	*0.122*	*−2.29**	*−0.151*	*0.576*	*−0.262*
Activity: Play	*0.639*	*0.084*	*7.65****	*0.564*	*0.690*	*0.817*
Autonomy				*0.357*	*0.107*	*3.35****
*Work*Autonomy*				*0.002*	*0.118*	*0.020*
*Study*Autonomy*				*0.049*	*0.170*	*0.290*
*Play*Autonomy*				*0.010*	*0.182*	*0.057*
Education				*0.003*	*0.080*	*0.032*
Age				*−0.0001*	*0.006*	*−0.017*
Gender				*0.097*	*0.146*	*0.668*
Life Satisfaction				*0.086*	*0.056*	*1.53*

Activity type is dummy coded with Rest being the reference condition, which therefore presents coefficients of zeros for the main effect and interaction.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Predicting momentary engagement

Intraclass correlation (ICC) calculated for the dependent variable of engagement indicated that 17% of engagement variability was attributable to individual differences, which warranted the preference of a multilevel analysis to a single-level regression. Following this, a series of multilevel multiple regression analyses was conducted by regressing momentary engagement on autonomous motivation towards the activity while controlling for the activity types at the momentary level (level 1) and controlling for age, gender, educational level, and general life satisfaction at the person level (level 2).

Results from the final model are presented in Table 2. In the initial model, only the activity categories were tested, all of which showed significant main effects with the rest category as the reference group (Work: $B = 0.151$, $t = 1.96$, $p = .05$; Study: $B = 0.522$, $t = 3.30$, $p = .001$; Play: $B = 0.634$, $t = 5.83$, $p < .001$); these significant effects similarly all disappeared once the autonomy measure was added to the model. Finding that the autonomy in the activity indicated a significant positive linear relationship to engagement as a main effect ($B = 1.46$, $t = 4.10$, $p < .001$), its quadratic effect was further tested, which was also found to be significant ($B = -0.228$, $t = -3.66$, $p < .001$). Interactions between autonomy as linear effect and activity type were also tested, which showed significant effect between work and rest ($B = 0.269$, $t = 2.38$, $p = .018$) but not between rest and study or play. Interactions between autonomy as a quadratic effect and activity type were not significant. No person-level controls showed significant main effects. Figure 2 presents the predicted patterns of engagement based on different levels of autonomy and types of activities according to the final model.

Predicting momentary meaningfulness

The intraclass correlation (ICC) calculated for the dependent variable of meaning indicated that 25% of meaning variability was attributable to individual differences, which warranted the preference of a multilevel analysis to a single-level regression. Following this, a series of

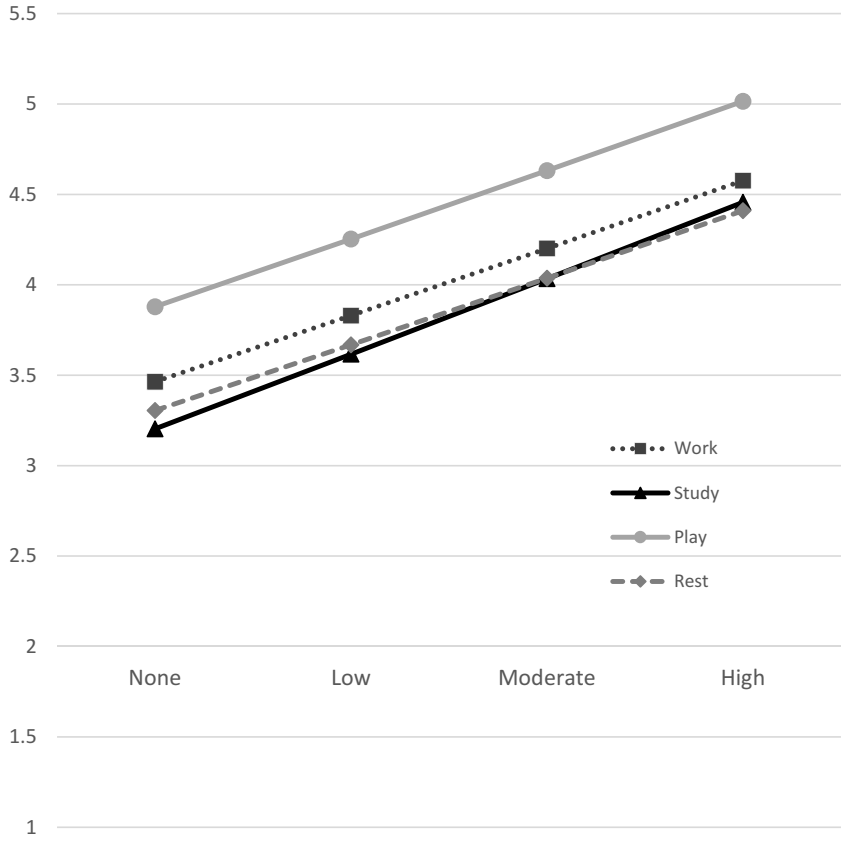

Figure 1. Momentary affect projected from the multilevel regression model based on the level of autonomy and type of activity.

Table 2. Momentary Engagement Regressed on Autonomy, Activity Type, and Person-level Controls.

	Activity-Only Model			*Full (Final) Model*		
	B	*SE*	*t*	*B*	*SE*	*t*
Intercept	*4.56*	*0.093*	*48.91****	*1.60*	*0.749*	*2.14**
Activity: Work	*0.151*	*0.077*	*1.96**	*−0.512*	*0.380*	*−1.35*
Activity: Study	*0.522*	*0.158*	*3.30***	*−0.036*	*0.604*	*−0.060*
Activity: Play	*0.634*	*0.109*	*5.83****	*−0.553*	*0.633*	*−0.87*
Autonomy				*1.46*	*0.358*	*4.10****
Autonomy^2				*−0.228*	*0.062*	*−3.66****
*Work*Autonomy*				*0.269*	*0.114*	*2.37**
*Study*Autonomy*				*0.197*	*0.186*	*1.06*
*Play*Autonomy*				*0.312*	*0.168*	*1.85*†
Education				*0.025*	*0.093*	*0.263*
Age				*0.009*	*0.007*	*1.34*
Gender				*0.151*	*0.171*	*0.888*
Life Satisfaction				*0.030*	*0.065*	*0.461*

Activity type is dummy coded with Rest being the reference condition, which therefore presents coefficients of zeros for the main effect and interaction.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$. $^{\dagger}.05 < p < .10$ (marginal significance).

multilevel multiple regression analyses was conducted by regressing the momentary meaningfulness on autonomous motivation towards the activity while controlling for the activity types at the momentary level (level 1) and controlling for age, gender, educational level, and general life satisfaction at the person level (level 2).

Results from the final model are presented in Table 3. In the initial model, only the activity categories were tested, all of which showed significant main effects with the rest category as the reference group (Work: $B = 0.451$, $t = 5.53$, $p < .001$; Study: $B = 0.754$, $t = 4.49$, $p < .001$; Play: $B = 0.592$, $t = 5.14$, $p < .001$); these significant effects either disappeared or weakened once the autonomy measure was added to the model. With the autonomy in the activity showing a significant positive linear relationship to meaningfulness as a main effect ($B = 2.01$, $t = 2.80$, $p = .005$), its quadratic effect was further tested, which was also found to be significant ($B = -0.379$, $t = -3.57$, $p < .001$). All interactions between autonomy as a linear effect and activity type referencing rest activity showed significant results (Autonomy x Work: $B = 0.683$, $t = 3.70$, $p < .001$; Autonomy x Study: $B = 0.495$, $t = 2.09$, $p = .037$; Autonomy x Play: $B = 0.740$, $t = 3.05$, $p = .002$). Interactions between autonomy as a quadratic effect and activity type were not significant. No person-level controls showed significant main effects in the final model except for age showing a marginally positive effect. For momentary controls of activity type, work and play activities bore significant negative main effects from the reference of rest in the final model. Figure 3 presents the predicted patterns of meaningfulness based on different levels of autonomy and types of activities according to the final model.

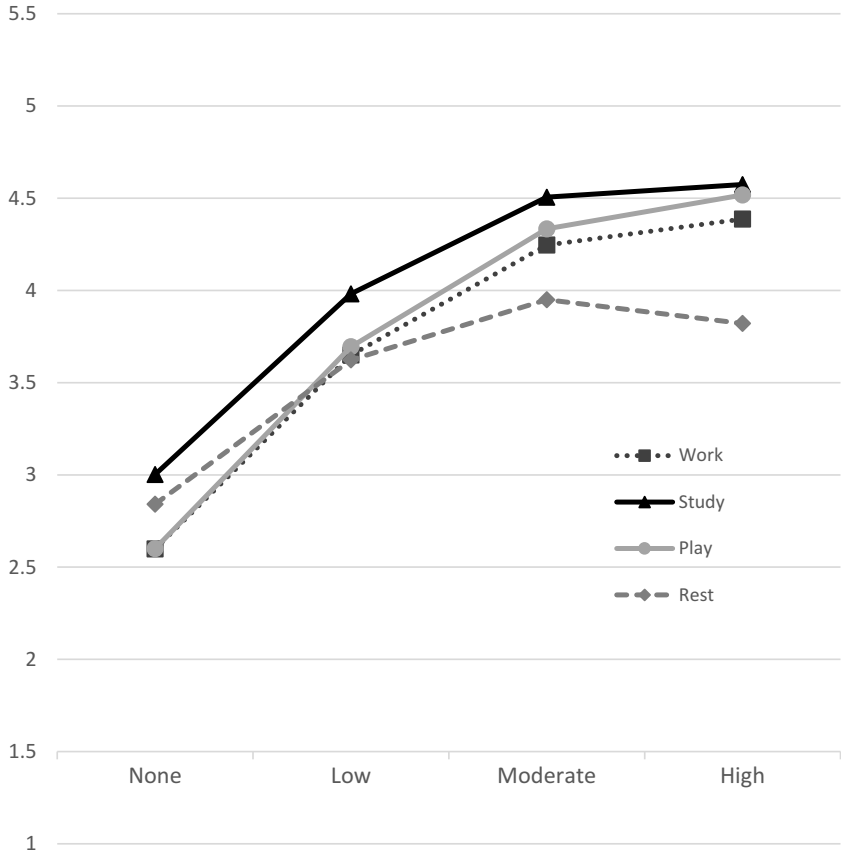

Figure 2. Momentary engagement projected from the multilevel regression model based on the level of autonomy and type of activity.

Table 3. Momentary Meaning Regressed on Autonomy, Activity Type, and Person-level Controls.

	Activity-Only Model			*Full (Final) Model*		
	B	*SE*	*t*	*B*	*SE*	*t*
Intercept	*4.02*	*0.112*	*35.75****	*1.28*	*1.43*	*0.90*
Activity: Work	*0.451*	*0.082*	*5.53****	*−1.77*	*0.641*	*−2.76***
Activity: Study	*0.754*	*0.168*	*4.49****	*−1.07*	*0.810*	*−1.33*
Activity: Play	*0.592*	*0.115*	*5.14****	*−2.35*	*0.920*	*−2.56**
Autonomy				*2.01*	*0.720*	*2.80***
Autonomy^2				*−0.379*	*0.106*	*−3.57****
*Work*Autonomy*				*0.683*	*0.185*	*3.70****
*Study*Autonomy*				*0.495*	*0.237*	*2.09**
*Play*Autonomy*				*0.740*	*0.243*	*3.05***
Education				*−0.030*	*0.117*	*−0.257*
Age				*0.015*	*0.008*	*1.78*†
Gender				*0.094*	*0.213*	*0.441*
Life Satisfaction				*0.040*	*0.082*	*0.486*

Activity type is dummy coded with Relax being the reference condition, which therefore presents coefficients of zeros for the main effect and interaction.

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$. $^{\dagger}.05 < p < .10$ (marginal significance).

Discussion

The present study examined the effect of state-level autonomy on three aspects of well-being: affect, engagement, and meaning (Peterson et al., 2005), which were assessed in real-time and repeatedly. Whereas a plethora of research has identified multiple factors that could influence well-being and happiness from moment to moment including motivational (e.g., autonomy), situational (e.g., type of activity), and personal (e.g., demographic) factors, these are often separately investigated. Definitions and measures of well-being outcomes also tend to vary from one study to another, making it difficult to compare, contrast, and synthesize findings across studies. This study has contributed to the literature by relating these potential predictors to the three commonly studied aspects of well-being outcomes, all simultaneously and with intensive longitudinal data using ESM.

Well-being as state-level affect

In explaining momentary affect, autonomy in the activity was the only significant predictor among those tested such that the more autonomously motivated one was in an activity, the more positive the experienced affect was, while holding constant the types of activity (work, study, play, or rest) and individual differences including age, gender, educational level, and

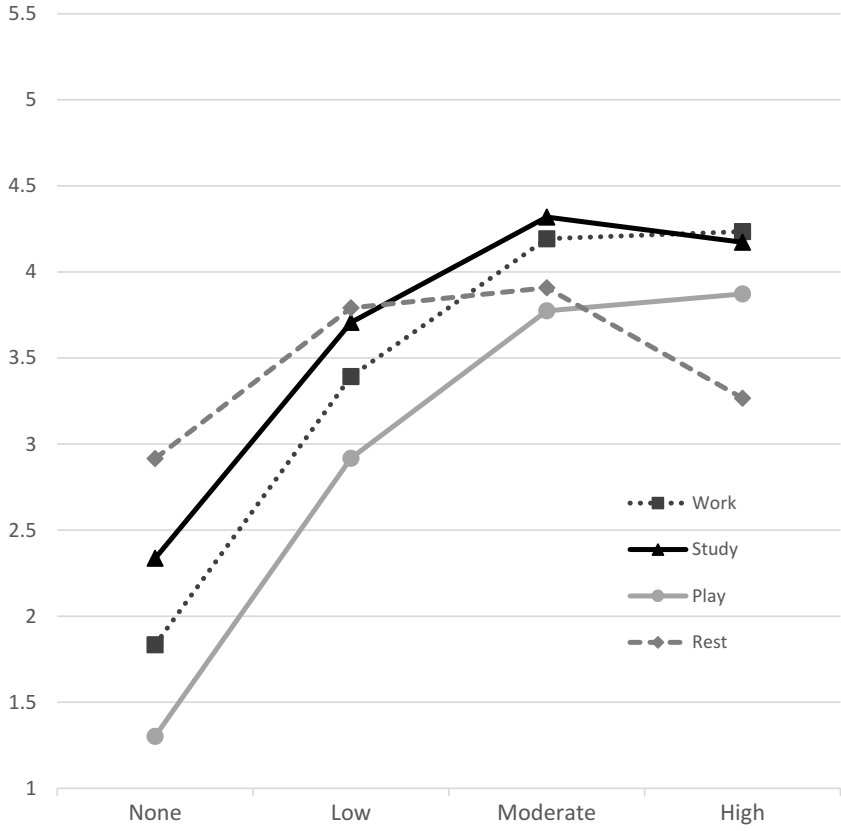

Figure 3. Momentary meaningfulness projected from the multilevel regression model based on the level of autonomy and type of activity.

general satisfaction with life. The results imply that once the level of autonomy is accounted for, people's type of pursuit may contribute no additional explanation of the strength of affect.

The present study thus replicated the results from Ryan et al. (2010) in that autonomy explains momentary affect more strongly than does the activity type. In both studies, this relationship between autonomy and affect was best understood as a positive linear association. In addition to the comparison specifically between work versus non-work situations examined by Ryan et al. (2010), the present study further distinguished work from study as types of productive activity, while adding play, a type of active leisure, and rest, a type of passive leisure (Csikszentmihalyi, 1997). Also consistent with and extending Ryan et al. (2010), significant variations in affect level among different types of activities were initially observed when activity was the only predictor but then appeared to be overridden by adding the level of autonomy in the equation. Although the results from this study alone do not directly inform why motivation seems to override the impact of activity, according to self-determination theory (e.g., Ryan & Deci, 2000), autonomy is among the most fundamental human needs, whose successful fulfilment could, in theory, weigh more heavily than other situational variations as feedback of well-being.

Importantly, this study employed a different, simplified operationalization of state-level autonomous motivation than the one used by Ryan et al. (2010) yet found the above mentioned, generally compatible results regarding the relationship among state-level affect, autonomy, and situational differences. In fact, this simplified measurement of autonomy has been employed in many ESM studies (e.g., Bassi & Delle Fave, 2011) but the current study was among the first to allow a comparison between the full and simplified scales on equivalent analyses. Although definitive conclusions cannot be drawn about the measurement from this study alone, the results were still informative and supportive of simplifying assessment, a type of trade-off commonly desired in ESM, considering its demanding sampling protocol.

Well-being as state-level engagement

Similarly, in explaining state-level engagement, autonomy in the activity was again the only significant

predictor but with a curvilinear pattern such that as the level of autonomy in the activity increased from none, through low, to moderate, so did the degree of engagement, which then plateaued from moderate to high levels of autonomy, even when controlling for the type of activity and individual-difference variables. The results are compatible with an interpretation that beyond what people do, perceived autonomy may help increase their engagement in the activity at the state level, but they do not need to feel fully autonomous to be engaged; in other words, an extrinsic motive does not need to be eliminated as long as one experiences a moderate level of internalized, autonomous motivation. Despite the difference of pattern between affect (linear) and engagement (quadratic) in how autonomy relates to state-level well-being, in both cases, autonomy explains well-being more strongly than do situational or individual differences, again in line with Ryan et al. (2010).

Bassi and Delle Fave (2011) investigated autonomy's effects on various aspects of flow such as perceived concentration, happiness, and involvement within activities. In the present study, engagement plateaued at the highest autonomy and generally replicated the results from Bassi and Delle Fave (2011) except involvement in their study declined from moderate to high autonomy. Otherwise, the pattern is consistent in the two studies, unlike the pattern for affect reported earlier or prior research, such that the relationship between autonomy and engagement is not simply a linear positive relationship but is instead found to be quadratic. Because the present study simultaneously investigated effects of multiple contributors on multiple well-being outcomes, the results replicating Ryan et al. (2010), on one hand, in finding that autonomy linearly related to affect and, on the other hand, Bassi and Delle Fave (2011) in showing that autonomy instead related to engagement with a distinct quadratic pattern, together is profoundly informative.

Well-being as state-level meaningfulness

Interpreting the results on state-level meaningfulness requires sensitivity. Autonomy in the activity was the strongest, though not the only, predictor of momentary meaningfulness, also with a curvilinear pattern such that as the level of autonomy in the activity increased from none, low, to moderate levels, so did the amount of perceived meaning, which then plateaued from moderate to high levels of autonomy, controlling for the types of activity and set of individual differences. The results also allow an interpretation that beyond what people do, presence of perceived autonomy may help increase meaningfulness found in the activity at the state level. An extrinsic motivation again does not need to be eliminated so long as people experience a moderate level of internalized, autonomous motivation.

Further, some main effects of activity type that remained significant in the final model may also add to this relationship that, once autonomy is controlled for, somewhat counterintuitively, restful activities may be seen as more meaningful than work or playful activities on average. Finally, significant interactions add nuances to the autonomy effect on meaning. While meaningfulness experienced at work, school, and play may stay equally high once a moderate level of autonomy is reached, meaningfulness in restful activities is unique as shown in Figure 3. That is, resting because people feel somewhat required to is seen as more meaningful than resting because they have nothing else to do or purely want to do it. Potentially, the 'had to' for rest arises from biological necessity and is experienced differently than 'had to' for other types of activities that typically arise from expectation or obligation. Among the other activities, rather intuitively, playful activities seem to maintain the largest amount of marginal gain in meaningfulness as autonomy heightens.

Overall, whereas the idea of autonomy predicting well-being was generally supported, it became evident that depending on what aspect of well-being was measured, the specific patterns varied; how autonomy related to engagement and meaning shared relatively similar patterns compared to how autonomy related to affect. What accounts for this difference is not entirely clear but the aforementioned distinction between eudaimonic and hedonic well-being may play a role. Whereas Peterson et al. (2005) found that affect, meaning, and engagement are empirically three distinct aspects, researchers who discuss the eudaimonia-hedonia classification tend to largely position engagement on the eudaimonic side along with meaning (see Kashdan et al., 2008), suggesting that meaning and engagement may be taxonomically more homogeneous compared to affect as aspects of well-being. In fact, in investigating how trait-level orientations to meaning, engagement, and pleasure may differently relate to well-being outcomes, Schueller and Seligman (2010) found that meaning and engagement similarly and more strongly relate to life satisfaction than pleasure possibly because both meaning and engagement help nurture long-term positive resources while pleasure does not, which instead presents a conflict between short-term and long-term goals. From the perspective of autonomous motivation, meaning and engagement link us to both our past and future; by doing so, they may entail willingly doing

necessary things, such as taking risky actions to defend an abiding value or embracing tiresome practice to cultivate a desired skill, and this may be true whether we are working, studying or playing. Although these postulations require further validations, coming investigations will help clarify the potential mechanisms behind why motivation acts differently on affect, engagement, and meaning, which in turn work varyingly on one's overall well-being.

Limitations and future directions

Besides a general limitation that no causality can be sufficiently inferred due to the nature of an observational study, it needs to be acknowledged that, in exchange for capturing multiple constructs in momentary experiences with the ESM, the present study largely relied on single-item scales, which may raise concerns about measurement validity. In fact, with its intensive longitudinal design, ESM studies are generally bound to a manageable volume of questions about each sampling moment (i.e., per beep) to minimize its invasiveness to participants, considering that the sampling is usually repeated multiple times per day across multiple days. Because employing this method therefore may force each study to be relatively limited in its scope, replication and complementation among studies become especially crucial in collectively advancing the horizon of knowledge, to which this study added (e.g., Bassi & Delle Fave, 2011; Ryan & Deci, 2000). Further, the observation that there is a plateau for engagement and meaning whereas affect seems linear can introduce a question of measurement. Although capturing autonomy on a continuum is conceptually and empirically grounded (Ryan & Connell, 1989; Ryan & Deci, 2000; Ryan, Deci et al., 2006), it must be noted that until further validated, this idea only supports viewing autonomy as an ordinal scale but not necessarily as an interval or ratio scale.

Conclusions

Although past studies had already observed that situational (activity type) or motivational (autonomy) factors generally and separately contributes to well-being (e.g., Csikszentmihalyi & Hunter, 2003; Ryan & Deci, 2000), this study was among the first to look at activity type and motivation together while simultaneously comparing multiple well-being dimensions, illuminating what varies and what remains consistent across conditions. Autonomy was consistently found to override activity type in predicting well-being. While affect rose as autonomy heightened on a linear pattern, engagement and meaning plateaued after a moderate degree of autonomy, further demonstrating specific patterns of interactions between autonomy and each activity type. Further investigation is necessary to confirm or correct the specific directions and magnitudes of effects found in this study. With these specificities, the significance of this study also lies in demonstrating that this level of detail can be found about the contributors to state-level well-being with an ESM study. As momentary experiences of well-being may be building blocks accumulating to a more global view of good life, further studies either to replicate or challenge these results are now awaited, which will certainly help provide a more holistic understanding of well-being.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Atsushi Kukita http://orcid.org/0000-0001-6660-9087
Jeanne Nakamura http://orcid.org/0000-0002-1937-0840

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