



## Within-individual variability in self-concepts and personality states: Applying density distribution and situation-behavior approaches across cultures



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### ABSTRACT

Within-individual variability in self-concepts and everyday personality states and affects was investigated in two experience sampling studies using density distribution and situation-behavior approaches. In all seven cultures sampled, within-individual variability was substantial and self-concept and personality state variability exhibited moderate convergence. Variability in personality and affect states was moderately predicted by perceived need satisfaction in the situations. The density distribution and situation-behavior approaches were moderately convergent in identifying the most variable individuals, but the pattern of cultural differences differed in the two methods. Contrary to cultural psychology perspectives, cultural differences in within-individual variability did not consistently correspond to cultural differences in individualism–collectivism, dialecticism, or tightness.

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### 1. Introduction

Evidence of behavioral variability led some psychologists to question the existence of traits and emphasize the situational determinants of behavior (Mischel, 1968; Ross & Nisbett, 1991). More recently, however, within-individual variability has featured prominently in efforts to synthesize alternative perspectives in the person-situation debate (Fleeson & Nofle, 2008; Fournier, Moskowitz, & Zuroff, 2008; Mischel & Shoda, 1998). This synthesis has arisen from the recognition that both trait and situationist

perspectives are correct. Consistent with situationist perspectives, specific behaviors exhibit substantial within-individual variability. Once aggregated, however, consistent individual differences in behavioral tendencies are evident and indicative of stable traits (Epstein, 1979; Fleeson, 2001; Fournier, Moskowitz, & Zuroff, 2009; La Guardia, Ryan, Couchman, & Deci, 2000). A limitation of this research is that it has been conducted largely in Western countries. The extent of within-individual variability may differ across cultures. In the two studies reported here, we examined within-individual variability in seven diverse cultures. We applied two theoretical approaches that have figured prominently in recent efforts to incorporate consistency and within-individual variability into integrated frameworks, the density distributions approach (Fleeson, 2001) and situation-behavior profiles (Mischel, Shoda, & Mendoza-Denton, 2002).

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## 1.1. Theoretical perspectives

### 1.1.1. Density distributions

In Fleeson's (2001) density distributions approach, traits are conceptualized as distributions of personality states, where personality states refer to momentary enactments of the relevant trait. Trait-related consistency is reflected in the stable means of the distributions (e.g., average levels of extraversion states), while within-individual variability is revealed in the considerable variability around individuals' means. For example, using experience sampling methods, Fleeson (2001) showed that the amount of within-individual variability in Big Five personality states was about the same as between-person variation and nearly as great as within-individual variability in affect. In subsequent studies, Fleeson and colleagues (Fleeson, 2007; Fleeson & Leicht, 2006) showed that within-individual variability in personality states can be predicted from psychologically-active situational attributes. These studies are important because they show that within-individual variability is meaningful and systematic, not random or due to error (see also La Guardia et al., 2000; Ryan, La Guardia, Solky-Butzel, Chirkov, & Kim, 2005).

In the present study, we drew on Self-Determination Theory (SDT; Deci & Ryan, 2000) to identify attributes of everyday situations that might underlie within-individual variability in personality and affective states. SDT predicts that people express their traits differently in various situations as a function of how much their needs for autonomy, competence, and relatedness are satisfied in the situations (La Guardia & Ryan, 2007). The needs associated with SDT are of particular interest because SDT theorists have proposed that they are universally important across all cultures (Chirkov, Ryan, & Willness, 2005; Levesque, Zuehlke, Stanek, & Ryan, 2004). Indeed, in eight cultures, Church et al. (2012) found that need satisfaction in various roles partially accounted for cross-role variability in Big Five traits. Similarly, in three cultures, Lynch, La Guardia, and Ryan (2009) found that perceived autonomy-support accounted for within-individual variability across relationships in ideal-actual self-concept discrepancies. However, the impact of autonomy support was somewhat stronger in the United States than in Russia or China, raising the possibility that the situational attributes underlying within-individual variability may differ in their explanatory power across cultures.

### 1.1.2. Situation-behavior approach

In the situation-behavior approach, within-individual variability is represented as stable "if-then" situation-behavior profiles, or *behavioral signatures* (Fournier et al., 2008; Furr, 2009; Mischel et al., 2002; Smith, Shoda, Cumming, & Smoll, 2009). In Cognitive-Affective Personality System (CAPS) theory (Mischel, 2004; Mischel & Shoda, 1995), individual differences in these situation-behavior profiles are attributed to differences in the chronic accessibility and organization of cognitive-affective units such as goals, beliefs, expectancies, and competencies (Fournier et al., 2008; Mischel & Shoda, 1995). A few studies in the United States and Canada have derived behavioral signatures in children or adults (Fournier et al., 2008; Shoda, Mischel, & Wright, 1994). For example, Smith et al. (2009) found stable and distinctive situation-behavior profiles for youth coaches' supportive and instructional behaviors across three game situations (winning, losing, or in a close game). Although situation-behavior profiles in these studies were used to characterize within-individual variability in behavior, they can also be used to describe within-individual variability in self-concepts (e.g., trait ratings in different roles) (Church et al., 2012; English & Chen, 2007).

In the present studies, we applied both the density distribution and situation-behavior approaches to investigate within-individual variability in self-concepts and personality states across

cultures. Consistent with the density distribution approach, we operationalized behavior in terms of the Big Five personality states reported in daily situations or interpersonal interactions (Fleeson, 2001; Fleeson & Wilt, 2010). As in previous mono-cultural studies, we expected to find substantial and reliable within-individual variability and that this variability can be represented as stable if-then profiles or signatures. At the same time, we tested theoretical proposals offered by cultural psychologists, who have suggested that within-individual variability may be greater in some cultures than others.

## 1.2. Cultural perspectives

Cultural psychologists have proposed that within-individual variability may be greater in non-Western cultures. One theoretical perspective addresses the distinction between independent and interdependent self-construals, which are viewed as more prevalent in individualistic and collectivistic cultures, respectively (Markus & Kitayama, 1991; Suh, 2002). People with independent self-construals are expected to exhibit greater consistency because of their greater need to express their unique traits. In contrast, for people with interdependent self-construals, roles and relationships are expected to impact behavior more than traits, increasing within-individual variability (Heine, 2001; Markus & Kitayama, 1998). A second theoretical perspective attributes greater within-individual variability in East Asian cultures to dialecticism, a system of thought based in Eastern philosophical traditions and characterized by tolerance of contradiction, expectations of complexity and change, and holistic thinking (Peng & Nisbett, 1999). Because of their dialecticism, East Asians are thought to be more able than Westerners to store inconsistent information in their self-concepts and to behave in more variable ways across situations (Choi & Choi, 2002; Spencer-Rodgers, Williams, & Peng, 2010). A third theoretical framework addresses the tightness versus looseness of a culture (Gelfand, Nishii, & Raver, 2006; Gelfand et al., 2011). In tight cultures, where social norms and situational constraints on behavior are stronger, greater within-individual variability in both self-concepts and behavior might be expected.

Several studies have compared within-individual variability in self-concepts across cultures by assessing variability in trait ratings across roles or relationships. The range of cultures investigated has been quite limited, however. Suh (2002), Boucher (2011), and English and Chen (2007, 2011) found that Asians (or Asian Americans) exhibit greater variability in trait ratings than Americans (or European Americans). Cultural differences in within-individual variability in these studies were attributed to cultural differences in either self-construals or dialecticism. Church et al. (2012) and Church, Anderson-Harumi et al. (2008) compared a more diverse set of cultures. For example, in a study in eight cultures (United States, Australia, Mexico, Venezuela, Philippines, Malaysia, China, and Japan), Church et al. (2012) found that only Japanese exhibited reliably greater cross-role variability in trait ratings than Americans. Dialecticism, but neither self-construals nor cultural tightness, mediated some of the cultural differences.

While several cross-cultural studies have examined self-concept variability, only two have compared within-individual variability in daily behavior or affect. Oishi, Diener, Scollon, and Biswas-Diener (2004) found that Japanese, Hispanics, and Asian Indians exhibited greater variability in affect across situations than did a multiethnic sample of Americans in Illinois. In a daily process study, Church, Katigbak et al. (2008) found some tendency for Filipinos, as compared to Americans, to exhibit greater cross-situational variability in Big Five behaviors. Clearly, additional studies are needed to enable confident conclusions about cultural differences in within-individual variability in actual behavior. In addition, we could not identify any cross-cultural studies that

examined situation-behavior profiles or signatures in daily behavior.

Finally, there is also a need for studies that examine the convergence of self-concept and behavioral variability in various cultures. Role identity theory (e.g., Wood & Roberts, 2006) proposes that role identities (i.e., self-perceived traits in various roles) accurately reflect, to some extent, one's actual role experiences (e.g., trait-relevant behaviors) in the respective roles. Similarly, ecological-realistic perspectives propose that the self-perceived traits that comprise an important part of our self-concepts can be accurately inferred from behavior if observed in the context of trait-relevant activities (Baron & Misovich, 1993; Funder, 1995). From both perspectives, we would expect that individuals who exhibit greater behavioral variability will also exhibit greater self-concept variability and that situation-behavior profiles derived in self-concepts and behavior will converge to some extent in each culture.

### 1.3. Overview of the present studies

We examined within-individual variability in two cross-cultural studies. In Study 1, which was based on the density distributions approach, participants in the US, Venezuela, the Philippines, China, and Japan rated their personality states and their positive and negative affects three times a day for 20 days. In Study 2, we applied both the density distribution and situation-behavior approaches to examine within-individual variability in self-concepts, personality states, and affective states in the US, Mexico, Malaysia, China, and Japan. Participants rated their Big Five traits (i.e., self-concepts) in five specific roles, then rated their personality and affective states in multiple interpersonal interactions or roles each day for 14 days.

The data analyzed for Study 1 were part of a larger study that compared the manifestation of Big Five traits in personality states and affect across cultures (Ching et al., submitted for publication). The data analyzed for Study 2 were part of a larger study that tested the cross-cultural generalizability of the Personality and Role Identity Structural Model (PRISM; Wood & Roberts, 2006) (Ching et al., in press). Neither of these studies focused on within-individual variability or the hypotheses addressed here. For these studies, we selected a diversity of cultures expected to vary along the dimensions of individualism–collectivism, dialecticism, and tightness. Based on previous findings, we classified our United States samples (e.g., in planned contrasts) as individualistic and our samples in Mexico, Venezuela, the Philippines, Malaysia, China, and Japan as relatively collectivistic (Church, 1987; Díaz-Loving & Draguns, 1999; Hofstede, 2001). We classified the Asian samples, particularly those in China and Japan, as dialectical and the three non-Asian samples (US, Mexico, and Venezuela) as non-dialectical (Peng & Nisbett, 1999; Spencer-Rodgers et al., 2010). Finally, we classified Malaysia, China, and Japan as high in tightness and the US, Mexico, Philippines, and Venezuela as relatively loose (Gelfand et al., 2011). For the Study 1 and Study 2 samples in the present article, Ching et al. (in press) and Ching et al. (submitted for publication) reported results of mean comparisons on relevant cultural measures that generally supported these classifications, although somewhat less so for the individualism–collectivism dimension.

In both Study 1 and Study 2, we expected to find substantial within-individual variability in personality states and that this variability would rival the amount of variability exhibited for affects (Hypothesis 1). As argued by Fleeson (2001), affect variability provides a good comparison standard for variability in personality states, because affect is generally viewed as quite variable (e.g., Csikszentmihalyi & Hunter, 2003; Eaton & Funder, 2001; Eid & Diener, 1999; Kuppens, Oravecz, & Tuerlinckx, 2010). In Study 1, we expected perceived satisfaction of SDT needs in various situations (as well as needs for self-actualization and pleasure-stimulation)

to partially account for within-individual variability in personality states and affects (Hypothesis 2). In Study 2, we anticipated that individuals who exhibit more cross-role variability in their personality states will also tend to show greater cross-role variability in their self-concepts (Hypothesis 3). In addition, we expected to find reliable if-then profiles across roles in both self-concepts and personality states (Hypothesis 4) and that the self-concept and personality state profiles will exhibit some degree of convergence (Hypothesis 5). Although we expected these hypotheses to be supported in all cultures, we also examined whether there are cultural differences in the extent of within-individual variability and, if so, whether they correspond to cultural differences in individualism–collectivism, dialecticism, or tightness.

## 2. Study 1

In Study 1, participants in five cultures rated their Big Five personality states and positive and negative affect three times a day for 20 days. We examined the extent of within-individual variability in personality and affective states (Hypothesis 1), whether cultures differ in the amount of within-individual variability, and whether within-individual variability can be accounted for to some extent by perceived satisfaction of needs in various situations (Hypothesis 2).

### 2.1. Method

#### 2.1.1. Participants

2.1.1.1. *United States.* The US sample included 56 college students (23 men, 33 women) at Washington State University, who completed a total of 3374 daily report forms across 20 days. Mean age was 20.32 years ( $SD = 3.24$ ). Self-reported ethnic backgrounds were as follows: White/Caucasian ( $n = 46$ ), multiracial ( $n = 4$ ), Latino ( $n = 3$ ), and African American ( $n = 3$ ).

2.1.1.2. *Venezuela.* The Venezuelan sample included 56 college students (21 men, 35 women) at the Catholic University of Táchira, who completed a total of 3332 daily report forms. Mean age was 20.16 years ( $SD = 1.83$ ). Participants reported the following ethnic backgrounds: Mestizo ( $n = 50$ ), European ( $n = 1$ ), Other ( $n = 1$ ), prefer not to answer ( $n = 4$ ).

2.1.1.3. *Philippines.* The Philippine sample included 60 college students (24 men, 36 women) at the De La Salle University in Manila, who completed a total of 3579 daily report forms. Mean age was 17.62 ( $SD = 1.47$ ). Self-reported ethnic backgrounds were Filipino ( $n = 59$ ) and not reporting ( $n = 1$ ).

2.1.1.4. *China.* The Chinese sample included 66 college students (23 men, 43 women) at Beijing Normal University, who completed a total of 4017 daily report forms. Mean age was 20.12 years ( $SD = 1.34$ ). Most participants reported their ethnicity as Han Chinese ( $n = 55$ ); other ethnic groups represented by 1–3 participants included Uyghurs, Tibetan, Zhuang, Miao, and Tujia.

2.1.1.5. *Japan.* The Japanese sample included 54 college students (26 men, 28 women) from Kwansei Gakuin University in Nishinomiya, who completed a total of 3261 daily report forms. Mean age was 20.19 ( $SD = .93$ ). Because of the anticipated ethnic homogeneity of the sample we did not ask about ethnicity, but did verify that none were international students.

#### 2.1.2. Instrument

2.1.2.1. *Translation.* The backtranslation method was used to translate the Daily Report Form from English into Spanish, Filipino

(Tagalog), Chinese, and Japanese. Minor modifications to the translations were made as necessary.

**2.1.2.2. Daily Report Form.** These forms, hereafter referred to as daily reports, took about 2–4 min to complete, and were used to assess participants' personality states, affect states, and need satisfaction three times per day. Personality states were assessed with fifteen adjectives, three for each of the Big Five traits (Goldberg, 1992; Saucier, 1994), including some reverse-keyed (*r*) traits: for Extraversion, *extraverted*, *energetic*, and *talkative*; for Agreeableness, *kind*, *helpful*, and *selfish*(*r*); for Conscientiousness, *organized*, *hardworking*, and *lazy*(*r*); for Emotional Stability, *calm*, *irritable*(*r*), and *nervous*(*r*); and for Openness to Experience, *open-minded*, *imaginative*, and *creative*. Affect states were assessed using four adjectives, two measuring positive affect (*enthusiastic*, *happy*) and two measuring negative affect (*upset*, *sad*) (Watson & Clark, 1994). Participants rated how accurately each state described them during the past half-hour using a 5-point scale that ranged from 1 (*not at all descriptive of me*) to 5 (*extremely descriptive of me*). For each report form, scores for each of the personality and affect states were computed by averaging the ratings for the relevant items, reverse-keying where necessary.

Table 1 shows the factor loadings obtained at the within-participant (17,563 observations) and between-participant ( $N = 292$ ) levels in a multilevel confirmatory factor analysis (CFA) of the Big Five state terms in the combined-culture sample (LISREL 8.8; Jöreskog & Sörbom, 2006). The simple structure solution with no secondary loadings fit the data fairly well (RMSEA = .065) and the loading pattern supported the hypothesized structure of the personality states both within- and between-participants. A few loadings were marginal ( $<|.30|$ ) in the between-participants structure, which is less relevant for the present analyses, which focus on

**Table 1**  
Results of multilevel confirmatory factor analysis in combined-culture sample: standardized loadings for within- and between-participant factors.

Big Five and affect states	Within participants	Between participants
<i>Extraversion</i>		
Extraversion	.72	.77
Talkative	.68	.72
Energetic	.70	.91
<i>Agreeableness</i>		
Kind	.64	.90
Helpful	.62	.96
Selfish	-.30	-.27
<i>Conscientiousness</i>		
Organized	.54	.78
Lazy	-.62	-.26
Hardworking	.63	.88
<i>Emotional stability</i>		
Calm	.31	.26
Irritable	-.73	-.56
Nervous	-.30	-.93
<i>Openness to experience</i>		
Open-minded	.51	.61
Creative	.63	.96
Imaginative	.54	.93
<i>Positive affect</i>		
Happy	.57	.78
Enthusiastic	.55	.82
<i>Negative affect</i>		
Sad	.71	.93
Upset	.66	.81
Happy <sup>a</sup>	-.23	-.32

Note: Separate multilevel analyses were conducted for the Big Five and affect states. All factor loadings are statistically significant,  $p < .01$ .

<sup>a</sup> Model fit was significantly improved by adding a secondary loading for *happy* on the Negative Affect factor.

within-individual variability. Table 1 also shows the factor loadings obtained in a separate multilevel CFA analysis of the positive and negative affect state terms. To identify the affect models (which had only two indicators per latent construct), we set the variances of the latent positive and negative affect variables to 1.0 and constrained the loadings of *happy* and *enthusiastic* on positive affect to be equal and the loadings of *sad* and *upset* on negative affect to be equal. Excellent model fit was obtained after allowing a negative secondary loading for *happy* on negative affect (RMSEA = .003).<sup>1</sup>

To examine cross-cultural measurement equivalence, we examined Big Five and affect models in each culture in which the factor loadings for the within- and between-participant structures were fixed to the (unstandardized) values obtained at each level in the combined culture models. For the Big Five states, model fit was fairly good in four of the cultures (RMSEA range = .058–.079), although somewhat worse in Japan (RMSEA = .099). Comparable tests of the affect model revealed fairly good model fit in Venezuela, China, and Japan (RMSEA range = .076–.079), but somewhat worse fit in the US (RMSEA = .110) and Philippines (RMSEA = .131). After minor modifications in each culture—for example, allowing *happy* and *enthusiastic* to load differently on positive affect, or introducing modest negative secondary loadings for *sad* or *upset* on positive affect—model fit ranged from fairly good to excellent across the five cultures (RMSEA range = .026–.078). Overall, the personality and affect states exhibited the hypothesized structure in each culture, and in most cases measurement invariance was fairly good. The multilevel factor loadings were also used to estimate composite reliabilities for the Big Five personality states (Geldhof, Preacher, & Zyphur, 2013; reliabilities cannot be computed for the two-item affect scales). The between-participant reliabilities ranged from .72 to .92 for extraversion, .76 to .92 for agreeableness, .58 to .81 for conscientiousness, .50 to .70 for emotional stability, and .57 to .94 for openness to experience. The within-individual reliabilities ranged from .63 to .79 for extraversion, .50 to .63 for agreeableness, .59 to .70 for conscientiousness, .38 to .52 for emotional stability, and .48 to .65 for openness to experience. These values are acceptable for short (3-item) scales—and justified our score composites for the various states—although the values were more marginal for emotional stability in the within-participant analyses.<sup>2</sup>

Consistent with the density distributions approach, within-individual variability was measured for each personality and affect state by computing the standard deviation (*SD*) of the participant's state scores across all daily reports (Church et al., 2012; Eid & Diener, 1999; Fleeson, 2001). For the personality states, stability correlations relating the *SD* indices in the first and second half of

<sup>1</sup> We also examined the equivalence of the within- and between-participant factor structures by comparing models in which the factor loadings at the two levels were freely estimated versus constrained to be equal. With our large number of observations, the  $\chi^2$  difference test comparing the freely estimated and constrained Big Five models was statistically significant ( $\chi^2 [10] = 223.20, p < .01$ ). However, the fit of the two models was very similar (RMSEA values of .065 and .066, respectively). For positive and negative affect, the constrained model was also significantly worse than the freely estimated model ( $\chi^2 [3] = 13.23, p < .01$ ), but model fit was still very good (RMSEA = .013). As expected, the factor loadings in the between-participant models tend to be larger than those in the within-participant models because the former are based on participant means across days, which will be more reliable than individual daily ratings. Nonetheless, these results indicate that the factor structures are fairly similar across levels of analysis.

<sup>2</sup> Additional multilevel analyses in each culture provided support for the convergent validity of the daily state assessments. As expected, extraversion states predicted positive affect states across daily reports (range of regression slopes across cultures = .33–.49,  $ps < .01$ ) and emotional stability states predicted negative affect states (range of regression slopes = -.45 to -.59,  $ps < .01$ ). These regression slopes were fixed effects when predicting positive or negative affect from all Big Five states simultaneously (Ching et al., in press). These concurrent validity findings were closely replicated in Study 2.

the participants' reports ranged from .61 to .76 ( $M = .69$ ) in the US, .59 to .72 ( $M = .66$ ) in Venezuela, .57 to .83 ( $M = .74$ ) in the Philippines, .69 to .83 ( $M = .75$ ) in China, and .73 to .81 ( $M = .78$ ) in Japan. Stability correlations for positive affect, which ranged from .66 to .76 ( $M = .72$ ) across the five cultures, were greater than those for negative affect, which ranged from .39 to .68 ( $M = .55$ ) across the five cultures.

Perceived need satisfaction was assessed for five needs, including three needs from Self-determination Theory (Deci & Ryan, 2000). Satisfaction of each need was rated on a single 7-point bipolar scale with verbal anchors at each pole adapted from Sheldon, Elliot, Kim, and Kasser (2001): for autonomy, 1 = *My behavior was freely chosen and very consistent with my true interests and values* to 7 = *My behavior was determined by others or external pressures and not consistent with my true interests and values*; for competence, 1 = *My behavior was very capable and effective* to 7 = *My behavior was incompetent or ineffective*; for relatedness, 1 = *I interacted with people I care for a lot and who care about me* to 7 = *I felt lonely and uncared for*; for self-actualization, 1 = *I felt my actions had important meaning or purpose for my life* to 7 = *I felt my actions had no meaning or purpose for my life*; and for pleasure-stimulation, 1 = *I felt a lot of enjoyment and pleasure* to 7 = *I felt bored and unstimulated*. The ratings for each need were reverse scored so that higher scores reflected greater perceived need satisfaction.

### 2.1.3. Procedure

Participants were recruited from regular classes or research participant pools. After training in small group sessions, participants were instructed to complete three Daily Report Forms each day for 20 days, one in the morning (e.g., 8 am–11 am), one in the afternoon (e.g., 1 pm–4 pm), and one in the evening (e.g., 8 pm–11 pm). Participants were provided with daily packets, each of which contained three such forms. Forms were retained as long as they approximated these time frames (e.g., some participants completed their evening forms after midnight). In the United States and Venezuela, participants submitted the forms via email after completion of each form. In the other three cultures, participants were asked to submit their completed forms daily or at least three times per week. A few participants in each culture were given extra days to complete more forms if they had missed some days and a few participants provided more than 60 daily reports.

A total of 17,563 daily report forms were completed across the five cultures. The mean number of forms completed per individual revealed good compliance with the instructions to complete three forms per day for 20 days: in the United States,  $M = 60.25$  ( $SD = 1.51$ ); in Venezuela,  $M = 59.50$  ( $SD = .76$ ); in the Philippines,  $M = 59.65$  ( $SD = .88$ ); in China,  $M = 60.86$  ( $SD = 1.64$ ); and in Japan,  $M = 60.39$  ( $SD = .88$ ).

## 2.2. Results and discussion

### 2.2.1. Extent of within-individual variability

**2.2.1.1. Comparison of personality and affect states within cultures.** In Hypothesis 1, we predicted that substantial within-individual variability in personality states would be exhibited in all cultures and that the amount of variability would rival that seen for affects. We used multi-level modeling, with daily reports nested within individuals, to estimate the amount of within-person and between-person variability. These were unconditional random intercept models and parameters were estimated using restricted maximum likelihood estimation. Fig. 1 shows the within- and between-person variances associated with each personality state and affect in the five cultures. Because these are absolute, not relative, variances, the within- and between-person variances need not sum to 1.00. As predicted, substantial within-individual variability in personality states was evident. With few exceptions, the

within-person variances were larger than the between-person variances. Indeed, the percentage of the total variance accounted for by within-person variability ranged from 51% to 76% ( $M = 67.40\%$ ) in the US, 50% to 75% in Venezuela ( $M = 63.80\%$ ), 46% to 80% in the Philippines ( $M = 68.40\%$ ), 49% to 74% in China ( $M = 58.80\%$ ), and 64% to 87% in Japan ( $M = 76.40\%$ ). These percentages were computed by dividing the within-person variance estimates by the sum of the within- and between-person variances (i.e., the total variance in the respective states). Although the within-individual variance estimates also incorporate some measurement error, they are clearly large relative to the between-person variances in all five cultures.

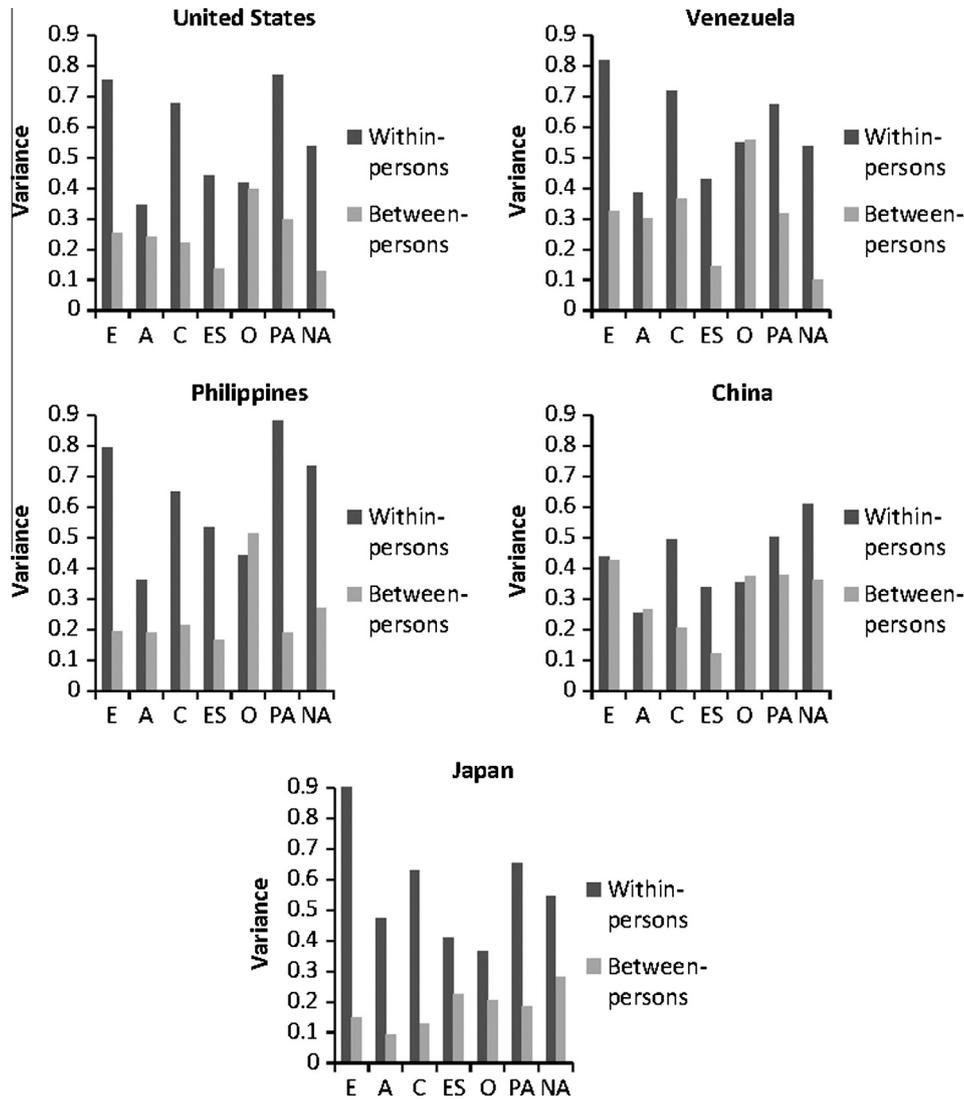
The means and standard deviations of participants' *SD* indices of within-individual variability are shown in Table 2. Within each culture we found large and significant differences in the *SD* indices across the various personality and affect states (repeated-measures ANOVAs;  $F[6,318-390] = 26.47-45.56$ ,  $\eta^2 = .33-.44$ ). Consistent with Hypothesis 1, in each culture, one or more personality states exhibited as much within-individual variability as did positive or negative affect (within each culture in Table 2, pairwise differences in the *SD* indices of .05 or greater were generally significant,  $p < .05$ , in dependent *t*-tests).

**2.2.1.2. Comparison of within-individual variability between cultures.** In a MANOVA comparing the *SD* indices for the personality states, we found a significant multivariate effect for culture (Wilks' lambda = .59,  $F[20,923] = 7.85$ ,  $p < .01$ ), but not for gender or the interaction effect. Follow-up ANOVAs revealed culture effects for all five personality states ( $F[4,282]$  range = 2.98–15.61,  $p < .05$ ). We tested planned contrasts that differentiated the cultures we classified as individualistic (United States) versus collectivistic (Venezuela, Philippines, China, and Japan); loose (US, Venezuela, the Philippines) versus tight (China, Japan); and non-dialectical (US, Venezuela) versus dialectical (Philippines, China, Japan). Although three of five contrasts for dialecticism ( $t[287] = -2.95$  to  $-1.97$ ,  $p < .01$ ) and four of five contrasts for tightness ( $t[287] = -3.15$  to  $-2.59$ ,  $p < .01$ ) were statistically significant, the pattern of *SD* indices did not support cultural psychology perspectives. Post-hoc Tukey tests revealed that the unexpected results were primarily due to the Chinese sample, which is dialectical and tight, but averaged lowest in within-individual variability for all five personality states (for each Big Five personality state in Table 2, cultural means that share a subscript were not significantly different,  $p < .05$ ).

In a MANOVA for positive and negative affect, we found statistically significant effects for culture (Wilks lambda = .83,  $F[8,562] = 7.06$ ,  $p < .01$ ) and gender (Wilks lambda = .97,  $F[2,281] = 4.47$ ,  $p < .05$ ), but not for the interaction effect. Follow-up ANOVAs revealed modest gender effects for both positive affect ( $F[1,282] = 3.96$ ,  $p < .05$ ,  $\eta^2 = .01$ ) and negative affect ( $F[1,282] = 8.74$ ,  $p < .01$ ,  $\eta^2 = .03$ ), with women averaging higher within-individual variability than men for both affects. Follow-up ANOVAs also revealed significant cultural differences for both positive affect ( $F[4,282] = 8.27$ ,  $p < .01$ ,  $\eta^2 = .11$ ) and negative affect ( $F[4,282] = 2.66$ ,  $p < .05$ ,  $\eta^2 = .04$ ). Only one planned contrast was statistically significant ( $t[287] = -4.32$ ,  $p < .01$ ). Participants in loose cultures, rather than tight cultures, reported greater variability in positive affect states. The unexpected results were primarily due to the Filipino participants, who reported greater variability in both affects than participants in the other four cultures, although only pairwise comparisons involving positive affect were statistically significant.

### 2.2.2. Need satisfaction and within-individual variability

One indication of the meaningfulness of within-individual variability is whether it can be accounted for by psychologically-active



**Fig. 1.** Within- and between-persons absolute variances for Big Five personality states and positive and negative affect states in five cultures. E = extraversion states. A = agreeableness states. C = conscientiousness states. ES = emotional stability states. O = openness to experience states. PA = positive affect states. NA = negative affect states.

**Table 2**  
Means and standard deviations for within-individual variability in personality states and affects in five cultures: Study 1.

State		US	Venezuela	Philippines	China	Japan	$\eta_p^2$
Extraversion	M	.84 <sub>b</sub>	.88 <sub>b</sub>	.85 <sub>b</sub>	.62 <sub>a</sub>	.95 <sub>b</sub>	.18
	SD	.21	.20	.27	.22	.25	
Agreeableness	M	.56 <sub>a,b,c</sub>	.59 <sub>b,c</sub>	.56 <sub>a,b</sub>	.47 <sub>a</sub>	.66 <sub>c</sub>	.09
	SD	.18	.19	.23	.18	.20	
Conscientiousness	M	.80 <sub>b</sub>	.82 <sub>b</sub>	.77 <sub>a,b</sub>	.67 <sub>a</sub>	.76 <sub>a,b</sub>	.05
	SD	.20	.22	.24	.21	.22	
Emotional stability	M	.63 <sub>a,b</sub>	.63 <sub>a,b</sub>	.70 <sub>b</sub>	.56 <sub>a</sub>	.61 <sub>a,b</sub>	.05
	SD	.20	.20	.22	.17	.20	
Openness	M	.61 <sub>a,b</sub>	.71 <sub>b</sub>	.61 <sub>a,b</sub>	.56 <sub>a</sub>	.57 <sub>a</sub>	.04
	SD	.21	.22	.26	.20	.19	
Positive affect	M	.85 <sub>b,c</sub>	.79 <sub>b</sub>	.91 <sub>c</sub>	.67 <sub>a</sub>	.79 <sub>b</sub>	.11
	SD	.23	.23	.25	.23	.17	
Negative affect	M	.68 <sub>a</sub>	.69 <sub>a</sub>	.81 <sub>a</sub>	.75 <sub>a</sub>	.70 <sub>a</sub>	.04
	SD	.28	.27	.28	.23	.25	

Note: Means in each row that share a subscript are not significantly different ( $p > .05$ ) in Tukey tests.  $\eta_p^2$  = partial eta<sup>2</sup> (i.e., ANOVA effect size), controlling for gender effects.

attributes of the situations encountered by the participants (Fleeson, 2007; La Guardia et al., 2000). In Hypothesis 2, we predicted that perceived need satisfaction would partially account

for within-individual variability in personality states and affects. Using multilevel modeling (MLM), we estimated random-slopes-and-intercepts models in which each personality or affect state

**Table 3**  
Fixed effect estimates in multilevel modeling relating need satisfaction to personality states and affects.

State	Need					Proportion of within-individual variability explained
	Autonomy	Competence	Relatedness	Self-actualization	Pleasure-Stimulation	
Extraversion	.02*	.08**	.12**	.05**	.17**	.42
Agreeableness	.02**	.08**	.06**	.03**	.06**	.28
Conscientiousness	.01	.17**	-.01	.12**	.03**	.30
Emotional stability	.07**	.03**	.01	-.01	.09**	.21
Openness	.04**	.05**	.03**	.04**	.08**	.24
Positive affect	.07**	.07**	.06**	.06**	.21**	.45
Negative affect	-.07**	-.06**	-.03**	-.02*	-.14**	.32

Note: The five needs were entered as simultaneous predictors of each personality and affect state.

\*  $p < .05$ .

\*\*  $p < .01$ .

was predicted from participants' perceived need satisfaction in the corresponding daily reports (for similar MLM analyses, see Fournier et al., 2008; La Guardia et al., 2000; and Lynch et al., 2009). These analyses were conducted in the combined-culture sample so that we could test for cultural moderation of the need-state relationships. Each need variable was person-centered to model a within-person process and restricted maximum likelihood estimation was used. The within-individual correlations relating satisfaction ratings for the five needs across the daily reports were frequently in the .30–.70 range, so we entered all five needs simultaneously as level 1 predictors of the state scores. Thus, in Table 3, the fixed effect estimates, which can be interpreted like unstandardized regression coefficients, reflect the unique contribution of each need to changes in personality or affect states controlling for the other needs.<sup>3</sup> The strongest unique relationships seen in the table make sense. For example, extraversion states were most uniquely predicted by pleasure-stimulation and relatedness needs. Participants reported greater conscientiousness states in situations in which they felt capable and effective (i.e., competence needs) and that contributed to a sense of meaning and purpose (i.e., self-actualization). Not surprisingly, satisfaction of pleasure-stimulation needs stood out as the best unique predictor of both positive and (inversely) negative affect states.

The last column in Table 3 shows the proportion of within-individual variability in each personality or affect state that was explained by the five needs. These proportions were computed by subtracting the residual (unexplained) variance in the models that incorporated the five needs as predictors from the residual variance in null models that did not include the needs, then dividing by the residual variance in the null models. Overall, the needs accounted for a moderate amount of the variability in the states, especially for extraversion and positive affect states. Thus, the needs assessed in this study may be particularly relevant to states that involve the experience of positive emotionality (Tellegen,

1985; Watson & Clark, 1997). Finally, it should be acknowledged that the direction of causality in these analyses is not definitive. It is plausible that levels of need satisfaction cause one to experience different levels of personality and affect states across situations. However, it is also possible that one's personality and affect states influence one's perception of need satisfaction in various situations.<sup>4</sup>

Finally, to determine whether the need-state relationships were moderated by the cultural contrasts representing individualism (versus collectivism), dialecticism (versus non-dialecticism), or tightness (versus looseness), we tested models in which one of the three cultural contrasts and the associated products with each need (e.g., dialecticism  $\times$  autonomy) were added as level 2 predictors in the models. Significant moderation ( $p < .01$ ) by one or more of the three cultural contrasts was observed for 16 of the 35 possible need-state relationships. Because our primary focus was on whether need satisfaction could account for within-individual variability *within* each culture, we offer only a few examples of apparently sensible albeit modest cultural differences. The positive relationships between relatedness need-satisfaction and extraversion and agreeableness states were modestly stronger in tight (versus loose) cultures and in dialectical (versus non-dialectical) cultures (range of fixed effects for the product terms = .04–.08). Inspection of the individual culture results, however, suggested that these moderator effects were largely due to the Japanese sample. In contrast, the positive relationship between satisfaction of competence needs and conscientiousness states was weaker in collectivistic (versus individualistic), tight (versus loose), and dialectical (versus non-dialectical) cultures (range of fixed effects = -.03 to -.07), although the differences were largely due to the stronger effect in the US sample.<sup>5</sup>

In summary, and consistent with Hypothesis 1, we found substantial within-individual variability in personality states in all cultures, and this variability rivaled that observed for affect states. Consistent with Hypothesis 2, this variability represented meaningful variation that was predictable to a moderate extent by perceived need satisfaction. Contrary to cultural psychology perspectives, cultural differences in within-individual variability were not associated with the individualism–collectivism, tightness, or dialecticism of the cultures, but we did observe some modest cultural differences in the strength of some need–state relationships. It is possible that cultural psychology perspectives will better account for cultural differences in within-individual variability when assessed across different roles (i.e., using the

<sup>3</sup> For example, the fixed effect estimate of .17 relating pleasure-stimulation needs to extraversion states indicates that for the average person in the combined-culture sample, an increase of 1 point in pleasure-stimulation need-satisfaction, relative to the individual's overall pleasure-stimulation mean, was associated with a statistically significant .17 increase in their extraversion state scores controlling for the other needs. Although not shown in Table 3, most of the random effect estimates for the slopes relating the needs to the states were also statistically significant, indicating the presence of individual differences in the strength of the relationships between the various needs and states.

<sup>4</sup> Although the items we adapted to measure need satisfaction were described by Sheldon et al. (2001) as need-satisfaction items, one anonymous reviewer suggested that the items may better measure need relevance because they do not directly assess whether the need was necessarily present in the daily situations. One might also argue that the items assess the extent to which the daily situations were conducive to, or afforded, satisfaction of the various needs. In any case, responses to the need items were able to account for a substantial proportion of within-individual variability in the personality and affect states. This demonstrated that within-individual variability was meaningful and systematic rather than random, a primary goal of the analysis.

<sup>5</sup> In supplemental analyses we also included participants' SD indices of within-individual variability for the relevant personality or affect state as level-2 predictors in the models relating need satisfaction to the states. This was done to control for possible cultural differences in within-individual variability in estimating the need-state relationships. Because doing so did not affect the results in Table 3 we reported the fixed effect estimates for the models that excluded these control variables.

situation-behavior approach), rather than across all reports, as in the density distributions approach. Therefore, in Study 2 we sought to replicate and extend the results of Study 1 in new cultural samples, applying both density distribution and situation-behavior approaches to within-individual variability.

### 3. Study 2

In Study 2, we obtained new samples from different universities in the United States, China, and Japan, and added two new cultures, Mexico and Malaysia. In planned contrasts, the US was again classified as individualistic and Mexico, Malaysia, China, and Japan were classified as collectivistic (Díaz-Loving & Draguns, 1999; Hofstede, 2001). Based on previous findings, we classified Mexico as relatively loose and Malaysia as tight (Church et al., 2012; Gelfand et al., 2011). As a result, planned contrasts for tight (Malaysia, China, Japan) versus loose (US, Mexico) cultures and dialectical versus non-dialectical cultures were not distinct in Study 2. We used a different experience sampling method in Study 2, in which participants rated their personality and affect states during their daily interpersonal interactions over the course of 14 days (i.e., event sampling). Participants reported their primary partner(s) for each interaction. Thus, in our situation-behavior analyses, interpersonal roles (i.e., with close friends, family members, classmates/acquaintances, professors, and strangers) comprised the different situations over which participants exhibited variability.

Previous cross-cultural studies have largely focused on cross-role variability in self-concepts (i.e., variability in trait ratings across different roles) (Church et al., 2012; Church, Anderson-Harumi et al., 2008; English & Chen, 2007, 2011; Suh, 2002). In Study 2, we examined self-concept variability, but also investigated the convergence of within-individual variability in self-concepts and daily personality states. In addition, applying the situation-behavior approach, we examined the degree of convergence between if-then profiles derived in self-concepts and personality states. Thus, in Study 2 we addressed (a) the extent of convergence between the density distribution and situation-behavior approaches to within-individual variability, and (b) the extent to which within-individual variability in self-concepts corresponds to the amount and pattern of within-individual variability in personality states.

#### 3.1. Method

##### 3.1.1. Participants

**3.1.1.1. United States.** The US sample included 66 college students (16 men, 50 women) from the University of Idaho, who completed a total of 5735 interpersonal interaction forms over 14 days. Mean age was 20.89 years ( $SD = 5.40$ ). Self-reported ethnic backgrounds were as follows: White/Caucasian ( $n = 52$ ), Latino ( $n = 5$ ), Asian ( $n = 1$ ), Native Hawaiian ( $n = 1$ ), multiracial ( $n = 5$ ), and other or not reporting ( $n = 2$ ).

**3.1.1.2. Mexico.** The Mexican sample included 60 Mexican college students (25 men, 35 women) from the National Autonomous University of Mexico at Iztacala, who completed a total of 5248 interpersonal interaction forms. Mean age was 19.65 years ( $SD = 2.43$ ). Participants reported the following ethnic backgrounds: Mestizo ( $n = 57$ ), Spanish ( $n = 1$ ), Indigenous ( $n = 1$ ), and not reporting ( $n = 1$ ).

**3.1.1.3. Malaysia.** The Malaysian sample included 59 college students (27 men, 32 women) from the National University of Malaysia in Bangi, who completed a total of 5397 interpersonal interaction forms. Mean age was 21.37 years ( $SD = .96$ ). Ethnic backgrounds were Malay ( $n = 29$ ), Chinese ( $n = 29$ ), and Bajau ( $n = 1$ ).

**3.1.1.4. China.** The Chinese sample included 70 college students (15 men, 55 women) from Henan Normal University in Xinxiang, Henan, who completed a total of 5885 interpersonal interaction forms. Mean age was 21.07 years ( $SD = .98$ ). All participants but one reported their ethnicity as Han Chinese ( $n = 69$ ).

**3.1.1.5. Japan.** The Japanese sample included 53 college students (28 men, 25 women) from Kansai University, who completed a total of 3548 interpersonal interaction forms. Mean age was 20.81 ( $SD = 1.14$ ). We did not ask about ethnicity, but verified that no participants were international students.

##### 3.1.2. Measures

**3.1.2.1. Translation.** The backtranslation method was used to translate the instruments from English into Spanish, Malaysian, Chinese, and Japanese. Minor modifications to the translations were made as necessary.

**3.1.2.2. Trait-Role Questionnaire.** To measure within-individual variability in self-concepts, we adapted the Trait-Role Questionnaire (Church, Anderson-Harumi et al., 2008). To reduce the total demands associated with an experience sampling study, we shortened the instrument from 40 to 25 items by selecting five trait adjectives, including some reverse-keyed ( $r$ ) traits, for each of the Big Five dimensions (Goldberg, 1992; Saucier, 1994): for Extraversion, *talkative*, *extraverted*, *energetic*, *shy(r)*, and *quiet(r)*; for Agreeableness, *sympathetic*, *kind*, *helpful*, *respectful*, and *selfish(r)*; for Conscientiousness, *organized*, *disciplined*, *hardworking*, *careless(r)*, and *lazy(r)*; for Emotional Stability, *calm*, *moody(r)*, *jealous(r)*, *nervous(r)*, and *irritable(r)*; and for Openness to Experience, *creative*, *imaginative*, *intelligent*, *artistic*, and *open-minded*. Using a 5-point scale (1 = *not at all descriptive of me* to 5 = *extremely descriptive of me*), participants rated their traits in general and then when interacting with close friends, family members, classmates or acquaintances, professors or teachers, and strangers. The traits were randomly ordered for each role. Church et al. (2012) used mean and covariance analysis to demonstrate acceptable measurement invariance of the Trait-Role Questionnaire across the cultures included in the present study. Validity evidence was reported by Church, Anderson-Harumi et al. (2008) and Church et al. (2012), who found, for example, meaningful cultural differences in cross-role consistency, sensible correlates of individual differences in consistency, and expected correlations with well-being measures.

To measure self-concept variability, we used the same procedure as previous investigators (Baird, Le, & Lucas, 2006; Church et al., 2012; Church, Anderson-Harumi et al., 2008; English & Chen, 2007, 2011). For each participant, we computed the  $SD$  of his or her ratings of each trait across the five interpersonal roles, then averaged the 25  $SD$ 's to obtain a single index. Alpha reliabilities were very good for all cultures: US, .85; Mexico, .85; Malaysia, .90; China, .89; and Japan, .83.

**3.1.2.3. Interpersonal Interaction Form.** These forms (hereafter referred to as interaction forms) assessed personality and affect states during participants' daily interpersonal interactions. Participants were asked to complete one of the forms after each interpersonal interaction lasting 5 min or more. Participants entered the time of day the interaction began, estimated duration of the interaction, type of communication (face-to-face, on the phone, online chat), and primary interaction partner(s) using the following roles: with close friend(s) or romantic partner, with family member(s), with classmate/acquaintance(s), with professor/teacher(s), and with stranger(s). Participants were asked to complete the forms as soon as possible after the interaction and somewhat evenly throughout the day. It took about 2–4 min to complete each form.

Personality states were assessed with ten adjectives from the Trait-Role Questionnaire, two for each of the Big Five traits: for Extraversion, *extraverted*, *energetic*; for Agreeableness, *kind*, *helpful*; for Conscientiousness, *organized*, *hardworking*; for Emotional Stability, *irritable(r)*, *nervous(r)*; and for Openness to Experience, *open-minded*, *imaginative*. The instructions were written to assess personality states rather than traits (i.e., “please indicate how accurately each trait described you during this interaction”). Affect states were assessed using four adjectives, two measuring positive affect (*enthusiastic*, *happy*) and two measuring negative affect (*sad*, *upset*) (Watson & Clark, 1994). Both personality and affect states were rated on a 5-point scale that ranged from 1 (*not at all descriptive of me*) to 5 (*extremely descriptive of me*). Because the personality state adjectives used in Study 2 were a subset of the items from Study 1, and the positive and negative affect items were the same, we did not retest the cross-cultural measurement invariance of the multilevel factor structure in Study 2.

To measure within-individual variability using the density distributions approach, we computed the *SD* for each personality and affect state across all interaction forms. As in Study 1, these indices were fairly stable across the first and second half of participants' reports ( $r$  range = .51–.85 [ $M = .75$ ] across cultures and personality states). As in Study 1, within-individual variability was again more stable for positive affect ( $r$  range = .71–.88 [ $M = .79$ ]) than for negative affect ( $r$  range = .53–.78 [ $M = .63$ ]).

To measure within-individual variability across roles for each participant (i.e., the situation-behavior approach), we first averaged the participant's ratings for each of the 10 personality state adjectives within each of the roles reported in their daily interactions. The result was an average score for each adjective in each role (e.g., *energetic* with close friends, *hardworking* with classmates). If participants reported at least two interactions in a particular role, they were scored for that role. We then computed the *SD* for each of the 10 adjectives across roles (e.g., cross-role variability for *energetic*). Finally, we averaged the 10 *SDs* for each participant to obtain a single index of cross-role variability for each participant. This procedure is analogous to that used by researchers who have investigated cross-role variability in self-concepts (Baird et al., 2006; Church et al., 2012; Church, Anderson-Harumi et al., 2008; English & Chen, 2007, 2011). Across the five cultures, alpha reliabilities ranged from .80 to .82.<sup>6</sup>

### 3.1.3. Procedure

After recruitment in classes, participants took part in group sessions in which they completed the Trait-Role Questionnaire and learned how to fill out the interpersonal interaction forms. Starting the next day, participants completed multiple interaction forms each day for 14 days. Participants were provided with daily packets, each of which contained eight interaction forms. Participants

were asked to complete one of the forms immediately following each interpersonal interaction of 5 min or longer. Participants were asked to return the completed forms daily, if possible, or at least three times per week.

Ching et al. (in press) reported descriptive statistics for the forms, which indicated that an average of 5–7 forms were completed daily by participants in each culture and that the mean duration of the interactions ranged from 20.12 to 45.42 min across cultures. Inspection of the times participants listed on the interaction forms revealed that they completed the forms throughout the day as instructed. In all cultures, the primary interaction partner(s) were most frequently close friends/romantic partners or classmates/acquaintances; the least frequent interaction partners were professors and strangers.

## 3.2. Results and discussion

### 3.2.1. Extent of within-individual variability in the density distributions approach

**3.2.1.1. Comparison of personality and affective states within cultures.** As in Study 1, multilevel analyses revealed that within-individual variability usually accounted for more than half of the total variance in the personality states. Percentages of within-individual variance ranged from 53% to 76% ( $M = 65.80\%$ ) in the US, 52% to 79% in Mexico ( $M = 63.80\%$ ), 52% to 71% in Malaysia ( $M = 60.80\%$ ), 44% to 65% in China ( $M = 56.00\%$ ), and 55% to 67% in Japan ( $M = 64.00\%$ ). Table 4 shows the means and standard deviations of the *SD* indices for the personality and affect states based on the density distributions approach. As in Study 1, repeated measures ANOVAs within each culture revealed significant differences in the *SD* indices between the various personality and affect states ( $F[6, 312-414] = 16.85-33.34, \eta^2 = .24-.36$ ) and in each culture one or more personality states exhibited as much variability as did positive or negative affect (within each culture in Table 4, pairwise differences in the mean *SD* indices of .06 or greater [or .04 or greater for China] were statistically significant,  $p < .05$ , in dependent  $t$ -tests). Thus, Hypothesis 1 was again supported because within-person variability in personality states was substantial in all cultures and the amount of variability rivaled that for affects.

**3.2.1.2. Comparison of within-individual variability between cultures.** In a MANOVA with the *SD* indices for the personality states as dependent variables, we again found a statistically significant

**Table 4**

Means and standard deviations for within-individual variability in personality states and affects in five cultures: Study 2.

State		US	Mexico	Malaysia	China	Japan	$\eta_p^2$
Extraversion	<i>M</i>	.80 <sub>c</sub>	.77 <sub>b,c</sub>	.68 <sub>a,b</sub>	.64 <sub>a</sub>	.75 <sub>b,c</sub>	.06
	<i>SD</i>	.22	.25	.22	.21	.19	
Agreeableness	<i>M</i>	.70 <sub>b</sub>	.82 <sub>c</sub>	.71 <sub>b,c</sub>	.58 <sub>a</sub>	.76 <sub>b,c</sub>	.09
	<i>SD</i>	.15	.25	.28	.20	.26	
Conscientiousness	<i>M</i>	.83 <sub>b,c</sub>	.91 <sub>c</sub>	.73 <sub>b</sub>	.54 <sub>a</sub>	.77 <sub>b</sub>	.16
	<i>SD</i>	.26	.27	.24	.20	.26	
Emotional stability	<i>M</i>	.60 <sub>b</sub>	.66 <sub>b</sub>	.56 <sub>b</sub>	.37 <sub>a</sub>	.62 <sub>b</sub>	.14
	<i>SD</i>	.20	.26	.22	.21	.19	
Openness	<i>M</i>	.70 <sub>a,b</sub>	.81 <sub>b</sub>	.70 <sub>a,b</sub>	.60 <sub>a</sub>	.60 <sub>a</sub>	.09
	<i>SD</i>	.22	.24	.24	.24	.19	
Positive affect	<i>M</i>	.86 <sub>b,c</sub>	.94 <sub>c</sub>	.82 <sub>b</sub>	.70 <sub>a</sub>	.75 <sub>a,b</sub>	.10
	<i>SD</i>	.21	.25	.27	.19	.21	
Negative affect	<i>M</i>	.66 <sub>b,c</sub>	.73 <sub>c</sub>	.69 <sub>c</sub>	.47 <sub>a</sub>	.55 <sub>a,b</sub>	.10
	<i>SD</i>	.26	.26	.29	.26	.24	

Note: Means in each row that share a subscript are not significantly different ( $p > .05$ ) in Tukey tests.  $\eta_p^2$  = partial eta<sup>2</sup> (i.e., ANOVA effect size), controlling for gender effects.

<sup>6</sup> These cross-role variability indices were computed across all available roles for each participant. Because some participants did not report interactions in all five roles, these indices were based on three or four roles in a minority of cases. To ensure that any cultural differences in within-individual variability were not due to cultural differences in the available roles for participants in the various cultures, we also computed *SD* indices across the three most universally reported roles (i.e., with friends, family members, and classmate/acquaintances) and across four roles (excluding professors, who in some cultures were less frequent interaction partners than strangers). In each culture, the *SD* indices based on three, four, and all available roles were highly correlated: .76–.91 in the US, .74–.91 in Mexico, .66–.86 in Malaysia, .71–.93 in China, and .85–.94 in Japan. In addition, we conducted all analyses using *SD* indices based on three roles, four roles, and all available roles (see Shoda et al., 1994 for a similar approach). The pattern of results was very similar in each case and the indices based on all available roles had the advantage of being based on larger sample sizes. Therefore, we report only the results based on the *SD* indices computed across all available roles. We also note that multilevel analyses might seem appropriate for these data, given the nesting of roles within individuals. However, multilevel modeling does not derive a variability index that is conceptually equivalent to the *SD* indices computed here and by other researchers.

effect for culture (Wilks' lambda = .63,  $F[20,976.04] = 7.31$ ,  $p < .01$ ) and no gender or interaction effects. Follow-up ANOVAs revealed significant culture effects for all five personality states ( $F[4,298]$  range = 7.10–13.68,  $p < .01$ ). In a MANOVA for positive and negative affect, we also found statistically significant effects for culture (Wilks' lambda = .86,  $F[8,594] = 6.06$ ,  $p < .01$ ) but no gender or interaction effects. Follow-up ANOVAs revealed significant cultural differences in within-individual variability for both positive affect ( $F[4,298] = 8.59$ ,  $p < .01$ ,  $\eta^2 = .10$ ) and negative affect ( $F[4,298] = 8.43$ ,  $p < .01$ ,  $\eta^2 = .10$ ). Planned contrasts comparing individualistic (US) versus collectivistic (Mexico, Malaysia, China, Japan) cultures and non-dialectical (US, Mexico) versus dialectical (Malaysia, China, Japan) cultures were statistically significant for some of the personality and affect states ( $ts[303]$  range =  $-2.75$  to  $-6.50$ ,  $p < .05$ ), but, in each case, the direction of the differences was contrary to expectations. As in Study 1, post-hoc Tukey tests revealed that the unexpected results were largely due to the Chinese sample, which averaged lower variability than the other four cultures for all five personality states and both affect states. In addition, the Mexican sample showed the highest average variability for four of the Big Five states (all but extraversion) and both affects. Not all of the pairwise differences between cultures were statistically significant, however (for each state in Table 4, cultural means that share a subscript were not significantly different,  $p < .05$ ).

We conducted a follow-up analysis in an attempt to explain the replicated finding in Studies 1 and 2 of reduced within-individual variability in the Chinese samples. We compared the frequency that participants in each culture used either of the two end categories of the five-point scales used to rate their personality and affect states. We found significant cultural differences in both Study 1 (ANOVA  $F[4,17,558] = 411.89$ ,  $p < .01$ ,  $\eta^2 = .09$ ) and Study 2 ( $F[4,25,808] = 438.85$ ,  $p < .01$ ,  $\eta^2 = .06$ ) and in both studies follow-up Tukey tests revealed that the Chinese participants used the end categories least frequently. This suggests that the cultural differences in within-individual variability observed with the density distributions approach might be due to a moderacy response bias in responding to the rating scales in the Chinese participants. Alternatively, it is conceivable that the Chinese participants were actually more moderate in their behavior in their interpersonal interactions.

### 3.2.2. Within-individual variability across roles in the situation-behavior approach

**3.2.2.1. Cultural differences.** In the density distributions analyses reported thus far, within-individual variability reflected the amount of variability across all daily reports (Study 1) or interpersonal interactions (Study 2), without reference to the interpersonal role or primary interaction partner involved. In the remaining results, we examine within-individual variability and if-then Big Five profiles or signatures across different roles or interaction partners. In Study 2, the *SD* indices of within-individual variability computed in the density distribution and cross-role analyses were generally moderately correlated (mean  $r$  range = .43–.62 across cultures). This indicates that individuals who exhibited more variability in their personality states across all reports also tended to report more variability across different roles, but the two types of variability are not redundant.

Table 5 shows the means and standard deviations of the cross-role *SD* indices for the self-concepts and personality states in each culture. Preliminary analyses revealed no main or interaction effects involving gender, but significant cultural effects were revealed for both self-concept variability ( $F[4,303] = 5.35$ ,  $p < .01$ ,  $\eta^2 = .07$ ) and personality state variability ( $F[4,303] = 9.78$ ,  $p < .01$ ,  $\eta^2 = .11$ ). Planned contrasts comparing individualistic versus collectivistic cultures and non-dialectical versus dialectical cul-

**Table 5**

Means and standard deviations for cross-role variability indices in five cultures.

SD index	US	Mexico	Malaysia	China	Japan	$\eta_p^2$
Self-concept variability across roles						
<i>M</i>	.70 <sub>a,b</sub>	.81 <sub>c</sub>	.69 <sub>a</sub>	.69 <sub>a</sub>	.80 <sub>b,c</sub>	.07
<i>SD</i>	.18	.20	.23	.22	.18	
Personality state variability across roles						
<i>M</i>	.45 <sub>a,b</sub>	.53 <sub>b,c</sub>	.43 <sub>a</sub>	.38 <sub>a</sub>	.56 <sub>c</sub>	.11
<i>SD</i>	.16	.18	.16	.15	.22	

Note: Means that share a subscript are not significantly different ( $p > .05$ ) in Tukey tests.  $\eta_p^2$  = partial eta<sup>2</sup> (i.e., ANOVA effect size).

\* $p < .05$ , \*\* $p < .01$ .

tures were not statistically significant for either self-concept variability ( $ts[303] = 1.75$  and  $-1.13$ ,  $ps > .05$ ) or personality state variability ( $ts[303] = .79$  and  $-1.63$ ,  $ps > .05$ ). However, post-hoc Tukey tests revealed a rather consistent pattern of cultural differences, in which Mexicans and Japanese averaged the highest in cross-role variability in both self-concepts and personality states, although not all pairwise comparisons were statistically significant (in each row of Table 5, means that share a subscript were not significantly different). The relatively high cross-role variability of the Mexicans replicates the density distribution results in Study 2. However, the relatively high cross-role variability of the Japanese sample contrasts with their generally intermediate standing on variability in the density distributions approach.<sup>7</sup>

**3.2.2.2. Convergence of self-concept and personality state variability.** In Hypothesis 3, we predicted that individuals who exhibit greater cross-role variability in their personality states also tend to exhibit greater cross-role variability in their self-concepts. Consistent with this hypothesis, we found moderate correlations between the self-concept variability and personality state variability indices in all five cultures:  $r = .39$  in the US,  $r = .48$  in Mexico,  $r = .41$  in Malaysia,  $r = .34$  in China, and  $r = .49$  in Japan, all  $ps < .01$ . The correlations were not significantly different ( $\chi^2 [4] = 1.46$ ,  $p > .05$ , Hays, 1973, p. 664), indicating that there were no definitive cultural differences in the degree of convergence between self-concept and personality state variability. These results suggest that the variability of participants' self-perceptions of their traits across roles (i.e., self-concepts) accurately reflects to a moderate degree their personality state variability across these roles in actual interpersonal interactions.

**3.2.2.3. If-then situation-behavior profiles.** The convergence of if-then situation-behavior profiles provides an even more stringent test of the correspondence between self-concepts and personality states. Following procedures outlined by Furr and Funder (2004), we derived distinctive if-then profiles for each participant. Distinctive profiles were used because they capture what is unique about each individual's trait or state levels across situations (relative to others in the culture) and thus are not confounded by normative tendencies that can inflate assessments of consistency across situations (Cronbach, 1955; Furr & Funder, 2004). For example, to derive a distinctive if-then self-concept profile for extraversion for US participants we subtracted the US means for extraversion in the friend, family, classmate/acquaintance, professor, and stran-

<sup>7</sup> One should not conclude that personality state variability is lower than self-concept variability based on the smaller *SD* indices for personality state variability in Table 5. In computing the indices for personality state variability, personality states were first averaged across all interpersonal interactions in each role. Thus, the *SD* indices of personality state variability were computed on the means for each role, which would be less variable than the individual ratings used to compute the *SD* indices for self-concept variability.

**Table 6**  
Convergence of distinctive self-concept and personality state profiles.

Culture	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Openness
United States	.42**	.21*	.02	.22*	.16
Mexico	.28*	.33**	.22*	.10	.20 <sup>a</sup>
Malaysia	.34**	.23†	.22*	.16*	.22*
China	.26*	-.01	-.26**	-.01	.08
Japan	.18	.01	.13	.25*	.08

\*  $p < .05$ .

\*\*  $p < .01$ .

†  $p < .10$ .

ger roles from each participant's raw extraversion scores in the corresponding roles. The resulting deviation scores indicate the extent to which a given participant reported greater or less extraversion relative to their cultural mean in each of the five roles. To derive distinctive if-then profiles for extraversion personality states for US participants, we subtracted the US cultural mean for the aggregated extraversion state scores in the friend, family, classmate/acquaintance, professor, and stranger roles from each participant's aggregated (average) extraversion state scores in the corresponding roles. Equivalent procedures were used to derive if-then profiles for the other Big Five traits and states for participants in all cultures.

Although a variety of measures of profile agreement have been proposed, Furr (2009) noted that the Pearson correlation provides an appropriate measure when the researcher is primarily interested in agreement in the shape of the profiles. The distinctive profiles for the personality states exhibited moderate stability across the first and second half of the reports, with within-individual correlations ranging from .32 to .64 ( $M = .50$ ) in the US, .26 to .71 ( $M = .55$ ) in Mexico, .29 to .76 ( $M = .57$ ) in Malaysia, .32 to .62 ( $M = .49$ ) in China, and .35 to .90 ( $M = .70$ ) in Japan. Stability estimates for the self-concept profiles cannot be computed because the self-concept ratings were obtained only once. However, in a test-retest analysis using the Trait-Role Questionnaire, Church et al. (2012) reported mean stability correlations for distinctive self-concept profiles that ranged from .44 (for openness to experience) to .65 (for extraversion) across eight cultures.

Table 6 shows the means of the within-individual correlations relating the distinctive self-concept and personality state profiles in each culture (Fishers'  $r$ -to- $z$  transformations were used to compute the means). In the US, Mexico, and Malaysia, the distinctive self-concept and personality state profiles for three to five of the Big Five dimensions showed moderate convergence. In contrast, average convergence of the distinctive profiles was weak in China and Japan. Because we did not have a priori expectations regarding cultural differences in the convergence of the if-then profiles, we did not test any planned contrasts. However, to test for cultural and trait differences in profile convergence, we conducted repeated measures ANOVAs with culture as a between-subjects variable and Big Five dimension as a within-subjects (repeated) factor. The distinctive profile correlations (transformed to Fishers'  $z$  values) were the dependent variables. We found main effects for culture ( $F[4,301] = 3.07, p < .05$ , partial  $\eta^2 = .04$ ) and Big Five dimension ( $F[4,1204] = 3.36, p < .01$ , partial  $\eta^2 = .01$ ), but no culture  $\times$  trait interaction effect. In Tukey tests, the modest culture effect was accounted for by higher profile convergence in the Malaysian sample as compared to the Chinese sample. The trait effect was explained by the higher profile convergence for extraversion as compared to the other Big Five traits. Finally, it is important to note that in all cultures, some participants showed good agreement between their self-concept and personality state profiles, while other participants showed weak or even negative profile agreement.

## 4. General discussion

Research on within-individual variability can facilitate efforts to integrate structure and process approaches in the study of personality (Fleeson, 2004; Fleeson & Nofhle, 2008; Mischel & Shoda, 1998). Whereas structure approaches focus on individual differences in typical levels of traits, process approaches emphasize within-individual variability and the situational factors that can account for this variability. We applied both density distribution (Fleeson, 2001) and if-then situation-behavior (Mischel et al., 2002) approaches to investigate within-individual variability in personality states. We also examined need satisfaction as a situational attribute that can account for within-individual variability, the convergence of self-concept and personality state variability, and cultural differences.

### 4.1. Extent and meaningfulness of within-individual variability

Applying the density distributions approach, we found that within-individual variability in personality states is substantial, usually exceeds between-individual variability, and rivals that found for affects. The percentages of total variance accounted for by within-individual variability were similar to those reported by Fleeson and Gallagher (2009) in a mega-analysis of 15 US studies, which ranged from 49% to 78%. Thus our finding of substantial within-individual variability is not new, but we extended US findings to six additional cultures, suggesting that in all cultures, individuals' behavior is very responsive to situational contexts.

Importantly, we demonstrated that in each culture, within-individual variability was meaningful and systematic, rather than random. Evidence included (a) the relatively stable  $SD$  variability indices across the experience sampling reports; (b) the moderate correlations between self-concept and personality state variability; (c) the moderate stability of the distinctive if-then profiles; and (d) the ability of perceived need satisfaction to account for a substantial proportion (about 20–45%) of the within-individual variability in personality states. The latter results provide support for Self-Determination Theory (Deci & Ryan, 2000), which predicts that people in all cultures will express their traits differently as a function of their need satisfaction in various situations (La Guardia & Ryan, 2007; see also Church et al., 2012; La Guardia et al., 2000; Lynch et al., 2009; Sheldon, Ryan, Rawsthorne, & Ilardi, 1997). It is not surprising that need satisfaction did not account for more of the within-individual variability, because additional situational attributes likely contribute to within-individual variability in personality states (e.g., task orientation, status of interaction partners, relationship intimacy) (Fleeson, 2007; Fleeson & Leicht, 2006). The results are important because they help us to understand how traits are expressed across time and situations, consistent with a process approach to personality.

Future studies should investigate the antecedents and consequences of within-individual variability in various cultures. For example, more cross-cultural comparisons of the situational determinants of within-individual variability are needed. In addition,

some evidence suggests that within-individual variability may be associated with greater neuroticism and reduced subjective well-being in various cultures, indicating that within-individual variability may not be entirely adaptive (Boucher, 2011; Church, Anderson-Harumi et al., 2008; Church et al., submitted for publication; Donahue, Robins, Roberts, & John, 1993; Sherman, Nave, & Funder, 2010). To speculate, within-individual variability may only be adaptive when it reflects appropriate responsiveness to situational contingencies.

#### 4.2. Convergence of self-concept and personality state variability

Previous studies have examined either self-concept variability or behavioral variability, but not both. Similarly, if-then profiles have been investigated in either self-concepts (Church et al., 2012) or behavior (Fournier et al., 2008; Shoda et al., 1994; Smith et al., 2009), but not both. Therefore, in Study 2 we examined within-individual variability in both self-concepts and personality states and found moderate convergence in each culture. Indeed, the convergent correlations did not vary significantly across cultures. In a more stringent test, we examined the convergence of self-concept and personality state profiles and found moderate convergence in the majority of cases, as well as some cultural differences. Overall, convergence was greatest for the extraversion profiles. It is probably easier to accurately judge one's standing on extraversion traits and states because they are more observable than the other Big Five dimensions (Kenny, 1994).

The moderate correspondence between self-concepts and personality states—in both the variability (*SD*) indices and if-then profiles—provides support for ecological–realist perspectives on person perception (Baron & Misovich, 1993; McArthur & Baron, 1983). Ecological–realist perspectives propose that traits can be directly perceived in daily behavior by self and others, particularly if observed in the context of trait-relevant activities. Similarly, Funder's (1995) realistic accuracy model posits that personality traits are real characteristics of individuals and can be accurately observed in behavior under appropriate conditions, thus becoming an accurate aspect of self-concept. Finally, role identity theory proposes that role identities are largely translations of role experiences (in this case personality states) into trait terms (Wood, 2007). Each of these theoretical perspectives anticipates a degree of convergence between role-specific self-concepts and actual behavior or personality states in these roles. Our findings are important because they suggest that self-concept variability across roles accurately reflects, to a moderate extent, personality state variability in everyday experience.

#### 4.3. Density distribution versus situation-behavior approaches

As illustrated in Study 2, the density distribution and situation-behavior approaches can be applied simultaneously in the same data set, although we are not aware of previous attempts to do so. This enabled us to compare the two approaches. In all cultures, we found moderate correlations between within-individual variability as quantified using the density distribution and situation-behavior (cross-role) approaches. This indicated that individuals who were more variable in their personality states across all daily interactions (regardless of the interaction partner) also tended to be more variable across discrete social roles. The correlations were not so high, however, to indicate that the two approaches are redundant. The distinction between the two approaches was particularly salient when examining cultural differences in within-individual variability, as we note in our later discussion of cultural differences.

Both approaches seek to explain within-individual variability. In the density distributions approach, potentially relevant

situational attributes are assessed as continuous variables that may predict variability. In the situation-behavior approach, behaviors or personality states are assessed in aggregation in different situational contexts delineated as categories. A challenge for the density distributions approach is identifying psychologically-active situational attributes that account for within-individual variability. A challenge for the situation-behavior approach is identifying discrete situational contexts that differ in their psychological meaning or implications for behavior. A number of researchers have noted the difficulty in specifying meaningful taxonomies of situations (e.g., Reis, 2008; Sherman et al., 2010). Others have pointed out that the Cognitive–Affective Personality System (CAPS: Mischel & Shoda, 1995) that underlies the situation-behavior approach provides limited guidance regarding the psychologically-relevant attributes that differentiate situations (Fournier et al., 2008; Sherman et al., 2010).

Some researchers have successfully characterized situations as categories while likely capturing the psychologically-active attributes of the situations. For example, Fournier et al. (2008) found stable situation-behavior profiles across situations in which the primary interaction partner was perceived as agreeable and dominant, agreeable and submissive, quarrelsome and submissive, or quarrelsome and dominant. However, as Sherman et al. (2010) have noted, this approach is still limited because it incorporates only interpersonal situations and a limited number of situational attributes. In contrast, the density-distribution approach can more readily incorporate multiple situational attributes that may account for within-individual variability (although practical limitations regarding the number of predictors in a multilevel analysis must still be considered). Another advantage of the density distributions approach is that researchers avoid the problem of missing data. In the situation-behavior approach, some individuals may not encounter all of the situations across which situation-behavior profiles are derived (e.g., Shoda et al., 1994). In summary, the situation-behavior approach and the resulting if-then profiles have interpretive appeal. However, given some of the limitations of the approach noted here, we suspect it will be easier to use the density distributions approach to identify and test the multiple situational attributes that underlie within-individual variability.

#### 4.4. Cultural differences

Cultural psychology theory proposes that collectivism, dialecticism, and cultural tightness should be associated with greater within-individual variability, although existing theory has more explicitly addressed the situation-behavior (cross-role) approach than the density distributions approach (e.g., Boucher, 2011; English & Chen, 2007, 2011; Suh, 2002). Indeed, it is conceivable that the bases of within-individual variability might differ in the two approaches. For example, in the density distributions approach, cultural differences in within-individual variability might reflect, in part, temperamental differences that underlie the expression versus restraint of one's personality states across time. In contrast, in the situation-behavior approach, cultural differences in within-individual variability would probably be more strongly determined by cultural differences in social norms associated with various situational contexts.

In any case, the pattern of cultural differences in the present studies differed in the two approaches. A consistent finding with the density distributions approach was the lower within-individual variability of the Chinese samples due to their less frequent use of the end points of the scales used to rate personality and affect states. This may have reflected a moderacy response bias in Chinese participants' reporting of their personality states (i.e., a measurement issue). Alternatively, they may actually have been more moderate in their behavior during their interpersonal

interactions. Although it is plausible that participants in a collectivistic culture would report greater restraint in their behavior, for example, to avoid standing out from others, this pattern was not exhibited by participants in the other collectivistic cultures in the study. In contrast, with the situation-behavior approach, the primary cultural differences involved the Japanese and Mexican samples, who tended to exhibit more variability than the other cultural samples. The Japanese results are consistent with several previous studies that have found greater cross-role variability in self-concepts (Boucher, 2011; Church et al., 2012; Church, Anderson-Harumi et al., 2008; English & Chen, 2007, 2011; Suh, 2002) or daily affect (Oishi et al., 2004) in East Asians (or Asian Americans), as compared to Americans (or European Americans). Our Mexican results are generally similar to those in previous studies (Church et al., 2012; Church, Anderson-Harumi et al., 2008), although Mexican participants showed somewhat greater variability relative to the US sample in the present study.

Additional cross-cultural studies of within-individual variability are needed to resolve remaining questions regarding cultural differences. The results of the present and previous studies suggest that cultural differences in within-individual variability may be limited to comparisons of Americans with selected Asian cultures, rather than to comparisons of individualistic versus collectivistic, loose versus tight, and non-dialectical versus dialectical cultures more generally. Overall, our results suggest that within-individual variability in self-concepts and personality states is substantial and moderately convergent in all cultures and can be accounted for, in part, by perceived satisfaction of important needs in everyday situations.

#### 4.5. Limitations and future directions

There were several strengths of our studies. We sampled seven diverse cultures and applied both density distribution and situation-behavior approaches to within-individual variability. We investigated within-individual variability in both self-concepts and personality states. Two methods of experience sampling were used and a total of 17,563 daily reports in Study 1 and 25,813 interpersonal interactions in Study 2 were analyzed.

There were also several limitations. First, we sampled only college students, so broader samples in each culture should be included in future studies. Second, the number of participants in each sample was not large because of the time intensive and expensive nature of experience sampling studies. Third, we sampled only cultures in the Americas and Asia, so there is a need for similar studies in other parts of the world. Fourth, participants had some flexibility in when they filled out their situational reports, particularly in Study 1. Although the substantial variability observed in both studies and the use of alternative experience sampling methods in the two studies ameliorates this concern somewhat, future studies could obtain situational reports at random moments throughout the day.

#### 4.6. Conclusion

Within-individual variability in everyday personality states is substantial and rivals that observed for affects. This variability is moderately stable across situational reports and can be predicted to a moderate extent from psychologically-active situational attributes such as needs. Consistent with ecological-realist perspectives and role identity theory, self-concept and personality state variability exhibit moderate convergence in a range of cultures. Both density distribution and situation-behavior approaches provide cogent descriptions of within-individual variability, although it may be easier to incorporate multiple situational attributes in explaining variability using the former method. The two

approaches were moderately convergent in identifying the most variable individuals, but the pattern of cultural differences differed in the two methods. Contrary to cultural psychology hypotheses, cultural differences in within-individual variability did not consistently correspond to cultural differences in individualism–collectivism, dialecticism, or tightness, suggesting that cultural differences in within-individual variability may be limited to comparisons of Americans with selected Asian cultures. Overall, the results indicate that personality research in all cultures can benefit from incorporating within-individual variability into models of personality traits and behavior, facilitating efforts to integrate structure and process approaches in the study of personality across cultures.

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