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Advancement of the Subjective Vitality Scale: examination of alternative measurement models for Japanese and Singaporeans

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The Subjective Vitality Scale (SVS: Ryan & Frederick, 1997) is a 7-item self-report instrument to measure one's level of vitality and has been widely used in psychological studies. However, there have been discrepancies in which version of the SVS (7- or 6-item version) employed between as well as within researchers. Moreover, Item 5 seems not be a good indicator of vitality from a content validity perspective. Therefore, the present study aimed to evaluate the validity and reliability of the SVS for Japanese and Singaporeans rigorously by comparing 3 measurement models (5-, 6-, and 7-item models). To this end, the scale was first translated from English to Japanese and then the Japanese and English versions of the scale were administered to Japanese (n = 268) and Singaporean undergraduate students (n = 289), respectively. The factorial and concurrent validity of the three models were examined independently on each of the samples. Furthermore, the covariance stability of the vitality responses was assessed over a 4-week time period for another independent Japanese sample (n = 140). The findings from this study indicated that from methodological and content validity perspectives, the 5-item model is considered most preferable for both language versions of the SVS.

Vitality, a positive feeling of aliveness, is phenomenally salient and functionally significant for human health, motivation, and well-being (Ryan & Deci, 2001, 2008). Vitality is considered a complex and dynamic construct that is affected by both physical and psychological factors (Ryan & Deci, 2001). Ryan and Frederick (1997) defined subjective vitality as a subjective feeling of aliveness and energy available to the self, and developed a brief self-report measure, entitled the Subjective Vitality Scale (SVS).

The SVS consists of seven items and has been extensively validated through well-designed studies (Ryan & Frederick, 1997). The SVS has been widely used in the research on health, motivation, and well-being and cited extensively (Wiley Online Library, n.d.) and translated from English into other languages (e.g., Elliot et al., 2012; Dubreuil et al., 2014). Subjective vitality has been employed as a predictor or an outcome variable and found to be related to behavioral and health results (Ryan & Deci, 2008). For instance, subjective vitality has been associated with specific parts of brain activation and positive response mechanisms (e.g., Barrett et al., 2004). Furthermore, accumulating evidence indicates that when individuals are vital, they are more active and productive, demonstrate better coping with stress and challenge, and have greater mental health and wellness (e.g., Kasser & Ryan, 1999; Penninx et al., 2000; Ryan et al., 2010). Thus, the SVS is considered highly beneficial as a succinct measure of eudemonic well-being and a valid indicator of positive psychological well-being.

Despite the popularity of the SVS, there have been discrepancies in which item version of the SVS (7- or 6-item version) employed between as well as within researchers since Bostic et al. (2000) recommended excluding one negatively worded item (Item 2) as it exhibited relatively low loadings in their factor analytic study with a U.S. sample. For example, Ryan et al. (2010) used the original 7-item version of the SVS, whereas Elliot et al. (2012) used the 7- and 6-item versions in their Study 1 and 2, respectively. These discrepancies in the items used to measure subjective vitality are considered undesirable practically and theoretically for the progression of research employing the SVS because it is unsure whether the item discrepancies lead to the same research outcomes.

In addition, the efficacy of the 6-item SVS has been limited to its factorial validity and has not been

tested comprehensively by examining other aspects of construct validity (e.g., concurrent validity) and reliability (e.g., test–retest reliability). Although Elliot et al. (2012) used the SVS for Japanese university students, the psychometric properties of the SVS was not reported at the item level because the SVS was one of many measures in their study. Furthermore, Item 5 ("I look forward to each new day") might not be a good indicator of vitality from a content validity perspective because it seems to be more about optimism rather than energy (R. M. Ryan, personal communication, December 20, 2014). Given that the growing literature shows that vitality is an important topic for research (Ryan & Deci, 2008), it is considered significant to compare the psychometric properties of different versions of the SVS systematically and establish a standardized version of the SVS for facilitating future research and progress the literature on subjective vitality.

The present study

Instrument validation is an ongoing process consisting of multiple steps whereby one aims to accumulate evidence in favor of construct validity (Raykov & Marcoulides, 2011). Although the SVS has been widely employed in the research literature, the psychometric properties of the SVS have not been rigorously examined at the item level for non-Western samples (e.g., Asian). Furthermore, efficacy of the different item versions of the SVS should be examined comprehensively. To address these gaps in the literature, the current investigation aimed to evaluate the validity and reliability of the SVS rigorously at the item level for Japanese and Singaporeans with Japanese and English versions of the SVS. In doing so, the scale was first translated from English into Japanese and then the factorial and concurrent validity of three measurement models (5-, 6-, and 7-item SVS models) were examined independently on each of Japanese and Singaporean samples. Covariance stability of the SVS was also examined for a Japanese sample. Finally, measurement invariance was tested across two Japanese samples as well as Japanese and Singaporean samples.

Method

Participants and procedure

A total of 697 university students participated in the present study: 408 Japanese (Japanese Sample 1 [n = 268]: 183 men, 83 women, 2 unidentified; Japanese Sample 2 [n = 140]: 99 men, 41 women) and 289 Singaporeans (172 men, 117 women). The Japanese Sample 2 was employed to examine the covariance stability of the measures described blow. Japanese participants' ages ranged from 19 to 22 years (M = 19.6, SD = 1.1), whereas Singaporean participants' ages ranged from 21 to 36 years (M = 22.5, SD = 1.6). They were recruited by the authors from an introductory psychology course at a Japanese or Singapore university. The lecturer of the course administered a survey set during a lesson and provided standardized general instructions for completing it. Specific instructions were written at the top of each scale. The entire study was approved by an institutional review committee and adhered to the guidelines for ethical practice. Participation was voluntary and informed consent was received from each participant.

Measures

Subjective vitality

The SVS (Ryan & Frederick, 1997) is a 7-item self-report instrument that is designed to assess feelings of energy and vitality. There are two versions (i.e., state and trait levels) and the trait-level measure was used in the present study. The seven items were: "I feel alive and vital" (Item 1); "I don't feel very energetic" (Item 2 [Reverse]); "Sometimes I feel so alive I just want to burst" (Item 3); "I have energy and spirit" (Item 4); "I look forward to each new day" (Item 5); "I nearly always feel alert and awake" (Item 6); "I feel energized" (Item 7). Respondents were asked to indicate the degree to which the statement of each item was true for them 'in general in their life' on a 7-point Likert-type scale ranging from 1 (*not at all true*) to 7 (*very true*). The 6-item version of the SVS is comprised of Items 1, 3, 4, 5, 6, and 7 (Bostic et al., 2000), whereas the 5-item version of the SVS which is proposed in the present study consists of Items 1, 3, 4, 6, and 7.

After obtaining permission from Dr. Ryan (personal communication, April 3, 2011) to develop a Japanese version of the SVS, the scale was translated into Japanese by the first author who is a native Japanese speaker and fluent in English. Following the team approach used by Kawabata, Mallett, and Jackson (2008), the second author who is also a native Japanese speaker and a faculty member in sport psychology confirmed that all the items were appropriately translated into Japanese. Subsequently, a registered professional translator, who had not seen the original English version of the SVS, translated all Japanese items back into English. No major discrepancy was observed between the original and back-translated versions of the SVS, and therefore, conceptual and linguistic equivalence was considered to be achieved between the Japanese items and the corresponding English items in the SVS.

Life satisfaction

The Satisfaction With Life Scale (SWLS; Diener et al., 1985) is a 5-item self-report tool to assess life satisfaction (e.g., "I have been satisfied with my life"). The SWLS is a well-validated measure and has been used to evaluate the relationship between subjective vitality and life satisfaction (e.g., Ryan & Frederick, 1997). Therefore, the SWLS was also employed in the present study to compare three SVS measurement models from the perspective of concurrent validity. Consistent with the SVS, respondents were asked to indicate the degree to which they agreed with the statement of each item 'in general in their life' on a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The Japanese version of the SWLS (Sumino, 1994) was employed for the Japanese samples.

Data analyses

Confirmatory factor analysis (CFA) was conducted with M*plus* (Version 7.3; Muthén & Muthén, 2014) based on robust

maximum likelihood estimation as data were non-normally distributed. To assess overall model fit, several criteria were used: the M*plus* robust chi-square statistic (MLM which is also known as S-Bχ^2; Muthén & Muthén, 1998–2014), the comparative fit index (CFI; Bentler, 1990), the Tucker-Lewis index (TLI; Tucker & Lewis, 1973), the root mean square error of approximation (RMSEA; Steiger, 1990). In addition, Akaike information criterion (AIC; Akaike, 1987) was used to facilitate model comparisons. Values on the CFI and TLI that are greater than 0.90 and 0.95 are generally taken to reflect acceptable and excellent fits to the data. For the RMSEA, values of 0.05 or less indicate a close fit, and 0.08 or less indicate an adequate fit. Although there are no criterion values for the AIC, the model that produces the minimum AIC may be considered to be a potentially useful model because AIC favors parsimonious models (Akaike, 1987). For the assessment of the fit of individual items, standardized factor loadings were carefully examined. Items were considered to be stronger indicators of the hypothesized factor if they had (a) larger standardized factor loadings, (b) small standardized residuals which are proportions of the variances unexplained by each of the preceding factor), and (c) no modification indices suggesting re-specification of the hypothesized model (Kawabata et al., 2008).

Measurement invariance was tested across the Japanese Samples 1 and 2 (Data Point 1) as well as the Japanese Sample 1 and the Singapore Sample. Following the procedures proposed by Chen et al. (2005) and Cheung and Rensvold (2002), equality constraints were hierarchically imposed on the parameters across the samples in the following sequence: configural invariance (no constraints), factor loadings, and intercepts of observed variables. The invariance of two nested measurement models was considered to be tenable when the change in the value of the CFI was negligible (i.e., less than or equal to 0.01; Cheung & Rensvold, 2002), and the overall pattern of goodness-of-fit indices was adequate (Chen et al., 2005).

Results

Descriptive statistics

The means and standard deviations of the SVS and SWLS item scores are provided in Table 1.

Confirmatory factor analysis

Measurement model

The 1-factor measurement model of the 7-item SVS satisfactorily fit the data of the Japanese Sample 1 (Model 1 in Table 2). All standardized factor loadings were statistically significant, ranging from 0.31 (Item 2) to 0.89 (Item 7) with a mean of 0.73. Most loadings were substantial in which they were greater than 0.60 (Bostic et al., 2000) except for Item 2. The poor loading of Item 2 was consistent with the study by Bostic and colleagues. Furthermore, the standardized residual variance of Item 2 was 0.94, indicating that most of its variance was not explained by the Subjective Vitality factor. Overall fit of Model 2 (the 6-item model with Item 2 removed) and Model 3 (the 5-item model with Items 2 and 5 removed) was also adequate and comparable to Model 1. However, the AIC value for Model 3 was far smaller than that for Model 1 or 2, indicating a superior fitting model. Factor loadings for Models 2 and 3 similarly ranged from 0.69 (Item 3) to 0.89 (Item 7) with a mean of 0.80. The internal consistency of the SVS was assessed using Cronbach's (1951) coefficient alpha and McDonald's (1999) coefficient omega. As shown in Table 1, all the coefficients for the three different models were above 0.88 for the Japanese Sample 1. Surprisingly, the internal coefficients for Model 3 were slightly better than those for Model 1 in spite of its fewer items.

For the Singaporean Sample, the originally hypothesized model of the 7-item SVS did not fit the data adequately (Model 4 in Table 2). Modification indexes suggested specifying a residual covariate between Items 6 and 7. Residual covariances indicate systematic measurement error in item responses, and they are considered to be caused by characteristics specific either to the respondents or the items (Aish & Jöreskog, 1990). Such a systematic measurement error could be occurred if respondents interpret the content of two items highly overlapped although the items are worded differently. This could be the case for the English version of the SVS as Bostic et al. (2000) covariated measurement errors between Items 4 and 7 to make their model fit their data adequately. It is considered that the Singaporean Sample in the present study interpreted the content of Items 6 and Item 7 similarly as the items are about feeling energized and activated. The modified 7-item model (Model 5) with a residual covariate between Items 6 and 7 fit the data satisfactorily. All standardized factor loadings were statistically significant, ranging from 0.44 (Item 3) to 0.82 (Item 4) with a mean of 0.64. The residual covariance was 0.42 and statistically significant. The factor loading of Item 2 was 0.49, which was found to be the second weakest indicator among the 7 items. The standardized residual variance of Item 2 was 0.76, which indicated that much of its variance was not explained by the Subjective Vitality factor. Model 6 (the 6-item model in which Item 2 was removed from Model 5) and Model 7 (the 5-item model in which Items 2 and 5 were excluded from Model 5) provided an excellent fit to the data. However, the AIC value for Model 7 was far smaller than that for Model 5 or 6, indicating a superior fitting model. Factor loadings for Model 6 ranged from 0.45 (Item 3) to 0.83 (Item 4) with a mean of 0.67, whereas factor loadings for Model 7 ranged from 0.45 (Item 6) to 0.87 (Item 4) with a mean of 0.65. The internal consistency coefficients for the three different models were above 0.76 for the Singaporean sample (see Table 1). Although the internal coefficients for Model 7 were lower than those for Models 5 and 6, the result was considered reasonable because of its fewer items.

Table 1. Descriptive statistics of item scores for Japanese and Singaporean samples

Item	M	SD	α	ω (95% CI)		M	SD	α	ω (95% CI)
Japanese Sample 1 (n = 268)					*Singaporean Sample (n = 289)*				
Subjective Vitality Scale					Subjective Vitality Scale				
Item 1	4.12	1.38	7 items			5.27	1.10	7 items	
Item 2	4.69	1.46	0.88	0.89 (0.86–0.91)		4.83	1.40	0.82	0.81 (0.78–0.85)
Item 3	4.44	1.58	6 items			3.98	1.65	6 items	
Item 4	4.28	1.33	0.91	0.91 (0.89–0.93)		5.13	1.05	0.82	0.82 (0.78–0.86)
Item 5	3.93	1.51	5 items			5.00	1.27	5 items	
Item 6	3.93	1.37	0.89	0.89 (0.87–0.92)		4.00	1.38	0.77	0.76 (0.71–0.80)
Item 7	4.07	1.39				4.57	1.22		
Satisfaction With Life Scale					Satisfaction With Life Scale				
Item 1	3.24	1.38	5 items			4.17	1.42	5 items	
Item 2	3.49	1.49	0.82	0.83 (0.78–0.87)		4.81	1.29	0.81	0.81 (0.77–0.85)
Item 3	3.62	1.62				4.86	1.42		
Item 4	3.55	1.33				4.38	1.58		
Item 5	3.09	1.68				3.93	1.80		
Japanese Sample 2 (n = 140)					*Japanese Sample 2 (n = 140)*				
Time 1					Time 2				
Subjective Vitality Scale					Subjective Vitality Scale				
Item 1	4.36	1.33	7 items			4.49	1.25	7 items	
Item 2	4.64	1.48	0.88	0.89 (0.86–0.92)		4.55	1.44	0.88	0.89 (0.86–0.92)
Item 3	4.51	1.52	6 items			4.72	1.46	6 items	
Item 4	4.47	1.40	0.91	0.92 (0.89–0.94)		4.67	1.38	0.91	0.91 (0.88–0.94)
Item 5	4.24	1.53	5 items			4.38	1.49	5 items	
Item 6	4.34	1.44	0.90	0.90 (0.87–0.93)		4.27	1.31	0.90	0.90 (0.87–0.93)
Item 7	4.42	1.36				4.40	1.43		
Satisfaction With Life Scale					Satisfaction With Life Scale				
Item 1	3.44	1.32	5 items			3.39	1.37	5 items	
Item 2	3.66	1.38	0.87	0.87 (0.83–0.92)		3.65	1.39	0.90	0.91 (0.88–0.94)
Item 3	3.90	1.44				3.71	1.53		
Item 4	3.79	1.43				3.67	1.37		
Item 5	3.26	1.75				3.24	1.55		

CI = confidence interval. The Item 2 score of the Subjective Vitality Scale (Ryan & Frederick, 1997) was reversed for all the samples. Possible range of all the item scores was from 1 to 7 for the Subjective Vitality Scale as well as the Satisfaction With Life Scale (Diener et al., 1985).

Table 2. Goodness-of-fit statistics of the Subjective Vitality Scale models for Japanese and Singaporean samples

Model description		MLMχ^2	*df*	CFI	TLI	RMSEA	(90% CI)	AIC
Japanese Sample 1 (n = 268)								
M1	7-item model	31.536	14	0.978	0.968	0.068	0.036–0.100	5647.939
M2	6-item model (M1 – Item 2)	24.661	9	0.980	0.966	0.081	0.043–0.119	4703.305
M3	5-item model (M2 – Item 5)	18.493	5	0.980	0.960	0.100	0.054–0.151	3928.751
Singaporean Sample (n = 289)								
M4	7-item model	70.519	14	0.920	0.880	0.118	0.092–0.146	6081.344
M5	7-item model with a residual covariance	30.919	13	0.975	0.959	0.069	0.038–0.101	6040.928
M6	6-item model with a residual covariance	13.767	8	0.991	0.983	0.050	0.000–0.093	5087.911
M7	5-item model with a residual covariance	5.208	4	0.997	0.993	0.032	0.000–0.099	4290.623

MLMχ^2 = M*plus* robust chi-square statistic; CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval; AIC = Akaike information criteria. No residual covariance was included in the measurement models for the Japanese Sample 1, whereas residuals of Items 6 and 7 were covariated in Models 5, 6, and 7 for the Singaporean Sample.

Concurrent validity

Concurrent validity of the SVS responses was evaluated by examining the latent-factor correlation between Vitality and Life Satisfaction constructs. As shown in Table 3, the 2-factor CFA models consisting of the Vitality and Life Satisfaction factors adequately fit the data of the Japanese Sample 1 (Models 8–10) and the Singaporean Sample (Models 11–13). For the Japanese Sample 1, the correlations were 0.58, 0.58, and 0.56 for Models 8, 9, 10, respectively. For the Japanese Sample 2, the correlations were 0.51, 0.51, and 0.49 for Models 8, 9, 10 at the Data Point 1 and 0.50, 0.50, and 0.49 for Models 8, 9, 10 at the Data Point 2. For the Singaporean Sample, the correlations were 0.55, 0.57, and 0.53 for Models 11, 12, 13, respectively. Consistent with the study by Ryan and Frederick (1997), the significant correlations between of the Vitality and Life Satisfaction factors indicated that subjective vitality was related to better mental health and the size of the correlations were comparable across the models for all the samples.

Stability

The stability of the Vitality or Life Satisfaction factor over time was examined by assessing covariance stability (or stability for short) of the SVS or the SWLS across time. A stability coefficient (test–retest correlation) was independently calculated for the SVS and the SWLS from test–retest data collected from the Japanese Sample 2. Following recommendations by Marsh and Hau (1996), residual covariances were included between the same items across time. As indicated in Table 4, the 2-factor CFA models consisting of either Vitality or Life Satisfaction factors satisfactorily fit the data of the Japanese Sample 2. Stability coefficients for the three

Table 3. Goodness-of-fit statistics of the latent-factor correlation models for Japanese and Singaporean samples

Model description		MLMχ^2	*df*	CFI	TLI	RMSEA	(90% CI)	AIC
Japanese Sample 1 (n = 268)								
M8	7-item SVS + SWLS model	84.682	53	0.977	0.971	0.047	0.027–0.065	9963.809
M9	6-item SVS (M1 – Item 2) + SWLS model	70.011	43	0.979	0.974	0.048	0.026–0.068	9018.842
M10	5-item SVS (M2 – Item 5) + SWLS model	56.446	34	0.981	0.974	0.050	0.025–0.072	8250.582
Japanese Sample 2 (n = 140) at the data point 1								
M8	7-item SVS + SWLS model	92.549	53	0.956	0.945	0.069	0.044–0.091	5801.325
M9	6-item SVS (M1 – Item 2) + SWLS model	75.633	43	0.962	0.952	0.069	0.042–0.094	5233.578
M10	5-item SVS (M2 – Item 5) + SWLS model	57.209	34	0.969	0.958	0.066	0.034–0.094	4785.255
Japanese Sample 2 (n = 140) at the data point 2								
M8	7-item SVS + SWLS model	85.108	53	0.962	0.952	0.059	0.034–0.081	6280.485
M9	6-item SVS (M1 – Item 2) + SWLS model	71.638	43	0.965	0.955	0.062	0.035–0.086	5668.583
M10	5-item SVS (M2 – Item 5) + SWLS model	69.811	34	0.956	0.942	0.078	0.051–0.103	5137.169
Singaporean Sample (n = 289)								
M11	7-item SVS (M5) + SWLS model	119.317	52	0.946	0.932	0.067	0.051–0.083	10780.382
M12	6-item SVS (M6) + SWLS model	82.707	42	0.965	0.954	0.058	0.039–0.076	9823.841
M13	5-item SVS (M7) + SWLS model	65.277	33	0.966	0.954	0.058	0.037–0.079	9040.184

MLMχ^2 = M*plus* robust chi-square statistic; CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval; AIC = Akaike information criteria; SVS = the Subjective Vitality Scale (Ryan & Frederick, 1997); SWLS = the Satisfaction With Life Scale (Diener et al., 1985). No residual covariance was included in the SVS measurement models for the Japanese samples, whereas residuals of Items 6 and 7 were covariated in the SVS measurement models in Models 11, 12, and 13 for the Singaporean sample.

Table 4. Goodness-of-fit statistics of the covariate stability models for a Japanese sample

Model description		MLMχ^2	*df*	CFI	TLI	RMSEA	(90% CI)	AIC
Japanese Sample 2 (n = 140)								
M14	7-item SVS	113.026	69	0.952	0.937	0.068	0.044–0.089	5881.014
M15	6-item SVS (M1 – Item 2)	74.325	47	0.968	0.955	0.064	0.034–0.091	4886.343
M16	5-item SVS (M2 – Item 5)	49.643	29	0.970	0.953	0.071	0.035–0.104	4079.193
M17	SWLS	27.568	29	1.000	1.004	0.000	0.000–0.060	4190.244

MLMχ^2 = M*plus* robust chi-square statistic; CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval; AIC = Akaike information criteria; SVS = the Subjective Vitality Scale (Ryan & Frederick, 1997); SWLS = the Satisfaction With Life Scale (Diener et al., 1985). Residual covariances were included between the same items across time based on recommendations by Marsh and Hau (1996).

Table 5. Summary of fit statistics for testing measurement invariance of the Subjective Vitality Scale (5-item model)

Model description		MLMχ^2	*df*	CFI	TLI	RMSEA	Model comparison	ΔCFI
Japanese Samples 1 and 2 (Data Point 1)								
M18	Congfigual invariance	35.719	10	0.976	0.953	0.110	–	–
M19	Factor loadings invariant	47.799	15	0.970	0.960	0.101	19 vs 18	−0.006
M20	Model 2 with intercepts invariant	62.022	20	0.961	0.961	0.099	20 vs 19	−0.009
Japanese Sample 1 and Singaporean Sample								
M21	Congfigual invariance	25.088	9	0.986	0.969	0.080	–	–
M22	Factor loadings invariant	45.462	14	0.972	0.961	0.090	22 vs 21	−0.014
M23	Model 22 except for Items 6 and 7	39.845	12	0.976	0.959	0.091	23 vs 21	−0.010
M24	Model 23 with intercepts invariant	232.719	17	0.811	0.778	0.213	24 vs 23	−0.165

MLMχ^2 = M*plus* robust chi-square statistic; CFI = comparative fit index; RMSEA = root mean square error of approximation. No residual covariance was included in the measurement models for the Japanese samples, whereas residuals of Items 6 and 7 were covariated for the Singaporean sample.

different SVS models (Models 14–16) were 0.48, 0.47, and 0.46, respectively, over a 4-week period. Given that the stability coefficient for the SWLS was 0.62, the SVS responses were found less stable.

Measurement invariance

Based on the results of CFAs reported earlier, measurement invariance tests were conducted for the 5-item SVS measurement model across the Japanese Samples 1 and 2 (Data Point 1) as well as the Japanese Sample 1 and the Singaporean Sample. The results of the invariance analyses are summarized in Table 5. Measurement invariance was achieved at the factor-loading and intercept levels across the Japanese samples. These results indicated that factor loadings and intercepts were equivalent across the Japanese samples. On the other hand, measurement invariance was achieved partially at the factor-loading level with two freely estimated parameters (Items 6 and 7) across the Japanese and Singaporean samples. Given that residuals of Items 6 and 7 were covariated for the Singaporean Sample, the non-equivalent of factor loadings of the two items seemed to be associated with their residual covariance.

Discussion

The present study aimed to evaluate the validity and reliability of the SVS comprehensively at the item level because two out of 7 items (i.e., Items 2 and 5) were considered somewhat problematic from methodological and content validity perspectives. To address the psychometric issues of the SVS with its Japanese and English versions, the scale was first translated from English into Japanese and then the factorial and concurrent validity of the SVS responses were examined independently on each of the Japanese and Singaporean samples by employing CFA. In doing so, three different measurement models (5-, 6-, and 7-item models) were tested.

The three measurement models of the SVS provided a satisfactory fit to the data from the Japanese Sample 1, whereas they required a residual covariance between Items 6 and 7 to adequately fit the data from the Singaporean Sample. Consistent with Bostic et al.'s (2000) study, it was found that Item 2 was not a strong indicator of the Vitality factor for both Japanese and Singaporean samples. The poor loading of Item 2 was considered due to the wording effect of the negatively worded item (see Wang et al., 2014). Overall fit of alternative 6- and 5-item measurement models was comparable or better than that of the 7-item model for both of the samples. The AIC values consistently indicated for both samples that the 5-item model was a superior fitting model from a parsimonious perspective. Furthermore, it was found for both samples that the factor loadings and internal consistency of the items in the 5-item SVS model were substantial and its latent-factor

correlation with the Life Satisfaction factor was comparable to those of the 6- and 7-item SVS models.

Compared to the study by Ryan and Frederick (1997), the covariance stability coefficient of the SVS responses was found to be smaller despite the fact that the test–retest period employed in the present study was shorter (i.e., 4 week). Ryan and Frederick reported that the test–retest (bivariate) correlation coefficient over the 8-week period was 0.64 for the 7-item SVS responses collected from 40 university employees and students. The difference in the stability coefficient values between these two studies is considered due to the fact that dissimilar methods were used to produce the coefficients. That is, stability coefficients in the present study were computed within the framework of CFA with the inclusion of residual covariances between the same items across time. In fact, the covariance stability coefficient of the SWLS responses observed in the present study (0.62) was also smaller than the 8-week test–retest correlation coefficient (0.82) reported in Diener et al.'s (1985) study.

As for measurement invariance, configural invariance was established across the Japanese Sample 1 and the Singaporean Sample, despite the minor discrepancy in the model structure. This result indicated that participants belonging to these different samples conceptualize the construct (i.e., subjective vitality) in the similar way without having translation errors or data collection problems (Cheung & Rensvold, 2002). Given that measurement invariance for the 5-item SVS model was achieved at the factor-loading and intercept levels across the Japanese samples, it would be possible to compare the relationships between subjective vitality and other external variables as well as latent means across Japanese independent groups using the Japanese version of the 5-item SVS (see Chen et al., 2005). However, factor-loading invariance was partially achieved and intercept invariance was not established across the Japanese and Singaporean samples. Thus, the relationship between subjective vitality and other external variables should be compared cautiously across Japanese and Singaporean groups using the Japanese and English versions of the 5-item SVS.

In conclusion, the unique and significant contribution of the current investigation is that through using CFA, this study systematically addressed an important methodological question about the SVS responses that has not been comprehensively examined in the previous studies with the instrument. The 5-item SVS model is preferred from the content validity perspective (R. M. Ryan, personal communication, December 20, 2014). The findings from the current study with Japanese and English versions of the SVS indicated that the 5-item SVS model is considered most parsimonious and valid for Japanese and Singaporean samples to measure subjective vitality. Given that the SVS has been widely used in psychological studies, it would be useful to establish a parsimonious and standardized version of the scale. According to the findings of the present study, it is recommended using the 5-item SVS as its standardized version.

Perspective

The SVS (Ryan & Frederick, 1997) has been popular and widely used in the research on health and well-being. However, there have been discrepancies in which item version of the SVS (7- or 6-item version) employed between as well as within researchers (e.g., Ryan et al., 2010; Elliot et al., 2012). Instrument validation is an ongoing process and the psychometric properties of the SVS have not been rigorously examined at the item level for non-Western samples (e.g., Asian). Furthermore, efficacy of the different item versions of the SVS has not been examined comprehensively. To address these gaps in the literature, the current investigation aimed to evaluate the validity and reliability of the SVS for Japanese and Singaporeans with different language versions of the SVS by comparing three measurement models (5-, 6-, and 7-item models). The results from the present study with Japanese and English versions of the SVS indicated that the 5-item SVS model is considered most parsimonious and valid for Japanese and Singaporean samples to measure subjective vitality.

Key words: Measurement, psychometrics, confirmatory factor analysis.

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