Replication and Extension of Fulmer et al.'s (2010) finding that Individual and Culture-Level Extroversion Interact to Enhance Subjective Well-Being

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STUDY 1

Method

This study used random effects multi-level analyses to replicate Fulmer et al.'s (2010) finding that culture level extroversion moderated the effect of individual extroversion on subjective well-being (SWB). Whereas Fulmer et al. (2010) examined SWB alongside positive emotions in the past week and lifetime happiness, the present study focussed only on SWB. This was because SWB is the best validated of the three measures (Diener, Suh, Lucas & Smith, 1999); and, I aimed to reduce the number of parametric tests performed on the data. In addition, SWB was positively correlated with the other two outcomes.[1] Testing for multiple correlated outcomes may conflate the risk of Type 1 error.

Participants

Participants were from the 2001 International College Survey (ICS; Diener et al., 2001). There were 10,018 from 48 different countries (see Table 1). They were predominantly university students, and recruited from a number of locations in each country. The sample comprised 60.2% women; and, ages ranged from 'Below 18' to '28 and Above'. The median age was '20-21'.

Materials

[1] In the present study, there were moderate positive correlations between SWB and positive emotions ($r = .45$; $T(9355) = 48.89$, $p < .001$); and, lifetime happiness ($r = .44$; $T(9355) = 46.94$, $p < .001$).

Individual Extroversion. Extroversion was measured using Goldberg's (1992) Extroversion Scale. It comprises six items. An example is "start conversations". Each item was ranked on a five point Likert Scale (1 = "Very Inaccurate"; 5 = "Very Accurate"). In the present study, internal consistency was $\alpha = .75$. When item scores were averaged, the grand mean was 3.17 (SD = 0.79). Scale means, standard deviations and internal consistencies by country are in Table 1.

Country Extroversion. Country extroversion was measured in two ways. In Model 1 (below), with aggregated observer ratings of the Big Five personality dimensions from McCrae et al. (2005). According to this measure, mean culture-level extroversion was 49.81 (SD = 2.52). In Model 2, it was measured by the mean individual extroversion scores from participants in the ICS. According to this measure, mean culture-level extroversion was 3.15 (SD = 0.22).

Country Collectivism. Country collectivism was also measured in two ways. In Model 1, it was measured with the Societal Practised Collectivism scores in House et al. (2004). It measures the extent that people in each country identify with their family. According to this measure, mean culture-level collectivism was 5.3 (SD = 0.67). In Model 2, it was measured by the mean Cognitive and Social Orientations Scale (CSOS) scores from participants in the ICS. It comprises three items. An example is "It is important for me to maintain harmony within my group". Each item was ranked on a nine point Likert Scale (1 = "Strongly Disagree"; 9 = "Strongly Agree"). In the present study, internal consistency was $\alpha = .45$. Low internal consistency may reflect construct heterogeneity. According to this measure, mean culture-level collectivism was 18.96 (SD = 2.67).

Individual Subjective Well-Being. SWB was the outcome. It was measured using the Satisfaction with Life Scale (Diener, Emmons, Larsen and Griffen, 1985). It comprises five items. An example is "I am satisfied with my life". Each item was ranked on a seven-point Likert Scale (1="Strongly Disagree"; 7="Strongly Agree"). In the present study, internal consistency was $\alpha = .82$. When item scores were averaged, the grand mean was 4.48 (SD = 1.23). Scale means and internal consistencies by country are in Table 1.

Table 1

Means and Internal Consistencies for Extroversion and Subjective Well-Being (SWB) by Country; and, Correlations between Extroversion and SWB by Country

		Extroversion		SWB		*r*	
Country	N	M (SD)	A	M (SD)	α	*r*	95% CI
Australia	181	3.33 (0.86)	.82	4.92 (1.18)	.85	.24*	.10, .37
Austria	126	3.32 (0.67)	.65	4.87 (1.17)	.85	.34*	.17, .48
Bangladesh	95	3.12 (0.69)	.58	4.44 (1.13)	.72	-.10	-.29, .11
Belgium	115	3.24 (0.77)	.81	4.92 (1.06)	.86	.05	-.13, .24
Brazil	255	3.33 (0.75)	.64	4.89 (1.12)	.77	.22*	.10, .33
Bulgaria	125	3.46 (0.77)	.78	4.08 (1.09)	.79	.14	-.04, .31
Cameroon	113	2.92 (0.66)	.45	3.41 (1.06)	.61	.12	-.07, .30
Canada	102	3.44 (0.76)	.79	5.59 (0.85)	.74	.37*	.19, .53
Chile	356	3.39 (0.74)	.75	5.29 (0.98)	.80	.24*	.14, .33
China	348	2.93 (0.68)	.68	3.20 (1.00)	.66	.19*	.09, .29
Columbia	355	3.18 (0.72)	.69	4.93 (1.16)	.86	.23*	.13, .33
Croatia	147	3.50 (0.80)	.81	4.58 (1.24)	.85	.35*	.20, .49
Cyprus	97	3.24 (0.86)	.76	4.51 (1.16)	.83	.32*	.13, .49
Egypt	126	2.52 (1.12)	.93	3.60 (1.91)	.97	.77*	.69, .83
Georgia	99	3.03 (0.61)	.48	3.67 (1.22)	.78	.25*	.05, .43
Germany	151	3.23 (0.86)	.87	4.89 (1.02)	.82	.22*	.06, .36
Ghana	135	2.98 (0.72)	.60	4.21 (1.19)	.78	-.03	-.20, .14
Greece	218	3.28 (0.77)	.72	4.53 (1.11)	.80	.05	-.08, .18
Hong Kong	187	2.93 (0.77)	.80	4.17 (1.14)	.83	.24*	.10, .37
Hungary	693	3.24 (0.90)	.86	4.39 (1.16)	.81	.20*	.13, .27
India	126	3.15 (0.60)	.43	4.12 (0.94)	.44	.20*	.03, .36
Indonesia	229	3.11 (0.63)	.70	4.52 (1.02)	.76	.20*	.07, .32
Iran	174	3.08 (0.78)	.70	3.94 (1.31)	.85	.24*	.09, .38
Italy	309	3.26 (0.81)	.79	4.48 (1.17)	.84	.19*	.08, .29
Japan	160	2.68 (0.84)	.84	3.82 (1.21)	.86	.26*	.11, .40
Kuwait	71	3.05 (0.68)	.45	4.51 (1.27)	.84	.02	-.21, .25
Malaysia	352	3.07 (0.58)	.55	4.72 (0.88)	.56	.07	-.03, .18
Mexico	294	3.21 (0.66)	.65	4.89 (1.09)	.80	.25*	.14, .35
Nepal	92	2.96 (0.66)	.57	3.77 (1.02)	.65	.07	-.14, .27
Netherlands	38	3.29 (0.83)	.81	4.99 (1.04)	.80	.40*	.09, .64
Nigeria	237	2.77 (0.68)	.46	4.23 (1.21)	.71	-.05	-.17, .08
Philippines	192	2.97 (0.67)	.67	4.55 (1.03)	.78	.23*	.09,.36
Poland	556	3.22 (0.82)	.81	4.47 (0.95)	.79	.21*	.13, .29
Portugal	228	3.15 (0.85)	.82	4.76 (1.10)	.83	.32*	.19, .43
Russia	103	3.39 (0.76)	.75	4.53 (0.92)	.70	.13	-.07, .31
Singapore	86	3.17 (0.77)	.83	4.06 (1.22)	.87	.13	-.09, .33
Slovakia	107	3.40 (0.88)	.82	4.28 (1.10)	.83	.21*	.02, .38
Slovenia	274	3.29 (0.75)	.78	4.96 (0.95)	.80	.18*	.07, .30
South Africa	29	2.87 (0.81)	.74	5.04 (0.82)	.49	.22	-.16, .55
South Korea	172	2.95 (0.82)	.83	4.02 (1.17)	.85	.21*	.06, .35

Spain	347	3.33 (0.79)	.80	4.69 (1.01)	.81	.23*	.13, .33
Switzerland	140	3.28 (0.69)	.77	5.44 (0.79)	.76	.16	.00, .32
Thailand	172	2.83 (0.65)	.66	3.88 (1.00)	.70	.07	-.08, .21
Turkey	117	3.53 (0.70)	.78	3.91 (1.08)	.77	.29*	.12, .45
Uganda	93	3.21 (0.77)	.52	3.08 (0.93)	.47	-.44*	-.59, -.26
USA	357	3.27 (0.90)	.87	4.87 (1.19)	.86	.26*	.16, .35
Venezuela	185	3.50 (0.70)	.74	5.16 (1.06)	.85	.31*	.17, .44
Zimbabwe	89	2.76 (0.49)	.15	4.28 (1.16)	.80	-.29*	-.47, -.09

Note: All scores reported after acquiescent participants and outliers (± 3 SD from country mean) were deleted; and listwise deletion was applied.

* $p < .05$

Results and Discussion

Data management strategies were specified a priori. Participants were removed if they used only the middle points and/or end points of survey scales. Then, construct scores were deleted if they were more than three standard deviations from their country's mean. Finally, individual extroversion scores were group mean centred.

Two multilevel models were also specified a priori. They had random intercepts and slopes for individual extroversion, as well as compound symmetry correlation matrices.[2] Restricted maximum likelihood estimation was preferred to maximum likelihood estimation because it more accurately predicts random effects.

Both models assessed the interaction between individual and country-level extroversion on SWB; with country-level collectivism fit as the covariate. In Model 1, countries were included as per Fulmer et al. (2010). These countries were: Australia, Austria, Brazil, Canada, China, Germany, Hong Kong, India, Indonesia, Iran, Italy, Japan, Kuwait, Malaysia, Mexico, Nigeria, Philippines, Poland, Portugal, Russia, Slovenia, South Korea, Spain, Thailand, Turkey, and the USA. This model utilized all individual data for which there was corresponding country data.

In Model 2, country-level data were specified as the mean individual extroversion and collectivism scores observed by country in the ICS. Participants from all countries listed in Table 1 were included in this dataset, except Egypt (abnormally high correlations between individual extroversion and SWB) and Zimbabwe (abnormally low internal consistency for

[2] Compound symmetry correlation matrices assume that covariances within countries were equal to covariances between country means. They were considered appropriate for the present study because they reduced the risk of Type-2 error relative to the alternative: unstructured correlation matrices.

individual Extroversion). Country level data was likely less reliable in Model 2, due to sampling bias. Table 2 shows the effects for the interaction between individual and culture level extroversion in each of these models.

Table 2

Effects for the Interaction between Individual and Culture-Level Extroversion on Subjective Well-Being in Models 1 and 2

Model	Countries	Participants	b	β 95% CI[1]	T (p)
1	26	5,820	0.02	0.00, 0.04	2.48 (.01)
2	46[2]	9,039	0.25	-0.01, 0.50	1.91 (.06)

[1] There is no accurate way to report standardised R^2 estimates for multi-level models. Thus, confidence intervals for the raw effect were preferred.

[2] Participants from 48 countries were sampled in the International College Survey 2001. However, observations were removed for Egypt (abnormally high correlations between extroversion subjective well-being); and, Zimbabwe (abnormally low internal consistency for extroversion). See Table 1.

Model 1 successfully replicated effects observed in Fulmer et al. (2010). Although the original authors reported marginally different parameter estimates (Fulmer et al. (2010): b = 0.03 (SE = 0.01), t = 2.24), this was probably due to justifiable discrepancies in data management and/or modelling protocols. A particular strength of Model 1 was that measures of individual and culture level personality came from different personality scales, made at different times, and with different raters (i.e. self vs. other). Thus, they emerged in the relative absence of common method variance. Model 2 further supports the replicability of Fulmer et al. (2010) by showing convergent effects. Although the interaction was marginal, this was likely due to increased error associated with using a less reliable measure of country extroversion. Nevertheless, Model 2 demonstrated both the internal and external validity of the original findings by showing that effects were robust when variables were differently operationalized, and when the model was fit to more participants, who were also from more countries.

Therefore, Study 1 provides further support for Fulmer et al. (2010). However, a limitation is that effects were observed in the absence of comprehensive sets of controls. Study 2 aimed to eliminate possible confounds by fitting additional controls via mixed effects multi-level modelling.

STUDY 2

Method

Participants

McCrae et al.'s (2005) measure of country extroversion was preferred because it was better validated than the alternative. Due to the increased availability of control data, there were 6,159 participants in the present study (after listwise deletion; compared to 5,820 in Model 1). This was because participants from Belgium, Chile, Croatia and Switzerland were retained;[3] whilst, participants from Kuwait and Nigeria were omitted (due to the absence of country-level data). Thus, Study 2 comprised participants from 28 countries. They were 63.0% women and the median age was '20-21'.

Method

At the individual level, I controlled for age and gender. There is evidence that both are associated with extroversion (Boyce, Wood & Powdthavee, 2013; Costa, Terracciano & McCrae, 2001), and SWB (Diener et al., 1999). At the country level, I controlled for Hofstede's (2001) Cultural Dimensions *Individualism-Collectivism* and *Power Distance*. This measure of Individualism-Collectivism may encompass the measure of Collectivism in Model 1 Study 1, and has superior construct validity (Minkov & Hofstede, 2011). Both Individualism-Collectivism and Power Distance may be associated with country extroversion; as well as SWB (Hofstede & McCrae, 2004).[4] Finally, I controlled for country SWB.[5] The relationship between individual and country SWB is almost certainly dynamic and bidirectional (Fowler & Christakis, 2008). Moreover, there may also be an association between country extroversion and country SWB (Lynn & Steel, 2006). The country control variables are described below.

Individualism-Collectivism. Individualism-Collectivism is the degree to which individuals in a culture see themselves as autonomous versus comprised of mutually-dependent social

[3] Country level extroversion data for Switzerland were computed by averaging scores for French-speaking and German-Speaking Switzerland in McCrae et al. (2005).

[4] As per Hofstede and McCrae (2004), I also controlled for country GDP to increase the orthogonality of *Individualism* and *Power Distance*. Specifically, I controlled for GDP per capita in 2005, as reported by the *World Bank* (accessed 27/2/2015). Data from 2005 were selected because they were taken at roughly the same time as country extroversion scores.

[5] I acknowledge that fitting country-level SWB might be considered controversial. However, it did not meaningfully alter the interaction coefficient between individual and culture level extroversion. For example, when Model 3 was fit without country SWB, the interaction coefficient was b = 0.01 (T = 0.62; p = .54).

groups (Hofstede, 2001). Western European and North American countries typically have higher individualism than other countries. Scores were from Hofstede (2001). For countries in the present study, mean individualism-collectivism was 43.63 (SD = 24.01).

Power Distance. Power distance is the extent that relatively disempowered members of a society endorse the hierarchical power structures within that society (Hofstede, 2001). Latin American, Asian and African countries typically have higher power distance than Western European and North American countries. Scores were from Hofstede (2001). For countries in the present study, mean power distance was 62.66 (SD = 19.49).

Country SWB. Country SWB was taken from a composite of happiness measures available from the *World Database of Happiness* (accessed 2/3/2015). This composite measure has good psychometric properties (Veenhoven, 2004). For countries in the present study, mean country SWB was 6.35 (SD = 1.09).

Results and Discussion

Data management strategies were the same as Study 1. Two multilevel models were specified a priori. They had random intercepts; random slopes for individual extroversion; and, fixed slopes for age and gender. Again, they also had compound symmetry correlation matrices; and, used restricted maximum likelihood estimation.

Model 3 assessed the interaction between individual and country-level extroversion on SWB. The controls were individual age and sex; and, country individualism-collectivism, power distance and SWB. There was no evidence that individual and country-level extroversion interacted to predict individual SWB (b = 0.01; t = 1.00 (p = .32)). As such, I fit Model 4 to clarify the individual and country level factors that predicted SWB.

Model 4 assessed the interaction between individual extroversion; and, country extroversion, individualism-collectivism, power distance and happiness; on, individual SWB. The controls were individual age and sex. First, the interaction model was compared to the main effects model. There was no evidence for any interaction (χ^2 = 6.24; p = .18).[6] Thus, I reverted to the main effects model. Backwards reduction was used with alpha = .01. In the final model, both

[6] Maximum likelihood estimation was used for the models in the chi-squared analysis, to permit model comparison.

individual extroversion and country SWB were positively associated with individual SWB. There were no effects for country extroversion, individualism-collectivism or power distance. Of the covariates, age was negatively associated with SWB; whilst women had higher SWB than men, on average. Finally, the intercept suggests that for female participants of average age and extroversion, in countries with average SWB, individual SWB was slightly above "neutral" (individual SWB scale midpoint = 4). The factors retained in the final model are in Table 3.

Table 3

Final Main Effect Model for the Relationship Between Individual and Country Level Psychological Factors; and, Individual Subjective Well-Being (SWB) [1]

	Variable	Estimate	95% CI	T (p)
Intercept[2]		4.25	4.02, 4.48	36.43 (p < .01)
Covariates	Age	-0.05	-0.07, -0.03	-4.36 (p < .01)
	Sex[3]	-0.14	-0.20, -0.09	5.03 (p < .01)
Predictors	Ind. Extroversion	0.30	0.27, 0.33	17.30 (p < .01)
	Country SWB	0.45	0.25, 0.66	4.29 (p < .01)

Ind. Extroversion = individual level extroversion

Country SWB = country subjective well-being

[1] The full model comprised the following predictors, as well as their cross-level interactions: (individual) extroversion; and, (country) extroversion, individualism-collectivism, power distance and SWB. In addition, age and sex were included as covariates.

[2] The intercept is the average SWB of women with mean age and extroversion in the sample, and in countries with mean happiness.

[3] In the final model, women were specified as the comparison group. Thus, the negative coefficient for sex suggests that on average, men in the sample were unhappier than women.

Results suggest that in the presence of additional controls, which were plausibly related to both the predictor variable/s and the outcome, the interactive effect of individual and country level extroversion on individual SWB disappeared. This does not invalidate the results of Study 1. However, it does suggest that caution is necessary. Effects could have disappeared for two reasons. There could have been too much measurement imprecision in individual and/or country extroversion. Indeed, Goldbeck's (1992) Extroversion Scale has been superseded by more valid alternatives, such as the NEO-PI-R Extroversion Factor (McCrae & Costa, 1997). In

addition, country extroversion was measured from the responses of unrepresentative college samples; who in turn gave observer personality ratings for unrepresentative subsamples of their respective country populations. As a consequence, real effects may have been partially suppressed in Study 1, and wholly suppressed in Study 2. Alternatively, the interactive effects of individual and country extroversion are not necessary to predict SWB. Rather, a more parsimonious approach may be to model individual extroversion alongside other individual and cultural-level main effects, such as age, gender and country SWB.

Finally, results also suggest that country SWB predicted individual SWB. This supports Fowler and Christakis (2008), who suggests that culture-level SWB may impact individual SWB through affective contagion. According to this account, individuals may impact - but, also be impacted by - the moods and sentiments of others in their context. If correct, small increases in cultural SWB may iteratively increase individual SWB.

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