Journal of Well-Being Assessment (2020) 4:447–462
https://doi.org/10.1007/s41543-021-00043-7

ORIGINAL RESEARCH

Examining the Measurement Invariance of the LOT-R Measure of Optimism in the United States and Japan

Laura J. Long[1] · Qian Lu[2] · Rheeda L. Walker[3] · Matthew W. Gallagher[3]

Accepted: 19 August 2021 / Published online: 27 September 2021

Abstract
Western samples have demonstrated greater optimism than East Asian samples, however, the factor structure of the Life Orientation Test (LOT) is not always consistent. Measurement properties of scales may differ across cultures, potentially biasing estimation of group differences. This study examined the factor structure and measurement invariance of the LOT-Revised among Japanese and American adults. A representative sample of 1805 American and 1027 Japanese adults was utilized. CFA was used to compare 1-factor and 2-factor models of optimism within samples and examine the measurement invariance of the LOT-R across samples. The 2-factor model was superior and demonstrated partial weak invariance. Levels of optimism and pessimism were also compared across samples. Japanese adults demonstrated lower levels of optimism and greater levels of pessimism than American adults. Findings highlight the importance of assessing measurement invariance in cross-cultural research, suggest exercising caution when using the LOT-R, and provide evidence that optimism and pessimism function as separate constructs.

Keywords Optimism · Pessimism · Measurement invariance · Measurement equivalence · Cross-cultural · East Asian · Western

Researchers have long been interested in whether positive thinking can result in discernable positive outcomes and have more recently begun to compare these processes across cultures. One form of positive thinking that has received considerable attention is dispositional

✉ Laura J. Long
laura.long@times.uh.edu

[1] Department of Psychology, Texas Institute for Measurement, Evaluation, and Statistics, University of Houston, 4849 Calhoun Rd, Rm 483, Houston, TX 713-743-7825, USA

[2] Department of Health Disparities Research, University of Texas MD Anderson Cancer Center, Houston, TX, USA

[3] Department of Psychology, Texas Institute for Measurement, Evaluation, and Statistics, University of Houston, Houston, TX, USA

optimism, a personality trait constituting the tendency to anticipate favorable outcomes of events, or positive "generalized outcome expectancies" (Scheier & Carver, 1985). These positive expectations tend to elicit adaptive goal-directed behavior, which ultimately contributes to better functioning. Scheier and Carver's (1985)Self-Regulation Theory indicates that when a goal becomes salient or an obstacle is encountered, individuals pause to reflect and engage in self-feedback in order to ensure that their behavior is in line with their goals and reduce any discrepancy between them. When goal pursuit is expected to result in positive outcomes, individuals tend to experience positive emotions, greater motivation, and increased effort towards achieving goals. On the contrary, negative outcome expectancies promote negative emotions and disengagement from goal-directed behaviors or mental withdrawal (Carver et al., 1979; Scheier & Carver, 1982, 1992).

Optimism shares conceptual similarities with other types of positive outcome expectancies, such as hope. However unlike optimism, hope is a cognitive motivational state that emphasizes specific processes associated with goal pursuit in the form of *pathways* thinking, the ability to generate routes towards desired outcomes, and personal *agency*, or the ability to utilize these pathways (Snyder, 1991). Though both hope and optimism facilitate goal pursuit and generate positive emotions, optimism is a more general dispositional tendency to expect positive outcomes to events, whether due to personal resources or outside influences such as luck or support from others (Rand, 2018).

Optimism has demonstrated a robust relationship with superior mental health and positive functioning. Theories of optimism propose that those who have successfully navigated challenges in the past are more likely to expect positive outcomes and view themselves as competent and in control of their circumstances. Thus, it follows that optimism is associated with greater self-esteem, self-efficacy, and internal locus of control/causality(Alarcon et al., 2013; Scheier & Carver, 1985). Optimism is also associated with markers of positive functioning such as adaptive coping, higher quality of life, and greater subjective well-being. In addition, this form of dispositional positive thinking may act as a protective factor against the development of mental illness given that it is inversely related to depression, anxiety, and suicidal ideation (Alarcon et al., 2013).

While optimism is linked to positive mental health within Western populations, it remains unclear whether optimism operates consistently across cultures. Optimism is most commonly measured using the Life Orientation Test (LOT; Scheier & Carver, 1985) or the revised version of this scale (LOT-R; Scheier et al., 1994), which have been adapted for use in East Asian populations, including Japanese adults (Sumi, 2004). These measures are based on a unidimensional 1-factor conceptualization of generalized outcome expectancies in which optimism represents one end of a bipolar construct with pessimism as the opposing pole. The 1-factor structure has received substantial research support and has emerged in some East Asian samples (Carver, Scheier, & Segerstrom, 2010; Chiesi et al., 2013; Lai et al., 1998; Lai & Yue, 2000). However, other studies evaluating the factor structure and psychometric properties of these tests in both East Asian and Western samples have revealed a 2-factor structure that appears to represent optimism and pessimism separately (Chang et al., 1994; Creed et al., 2002; Huang et al., 2019; Lai & Yue, 2000; Lai, 1994). Other models have also been used to examine the possibility that the 2-factor structure reflects response bias due to the positive wording of the optimism items and the negative wording of the pessimism items, which may be associated with acquiescence or social desirability (Alessandri et al., 2010; Scheier & Carver, 1985). Yet, there is also evidence that optimism and pessimism demonstrate different relationships with outcomes such as stress (Chang et al., 1994), depression (Chang, 1997) extraversion, and

neuroticism (Marshall et al., 1992), which may not be consistent across cultures (Chang, 1996a), and some have argued that the two are better understood as related but distinct constructs (Kubzansky et al., 2004; Marshall et al., 1992). Thus, it is necessary to determine whether the LOT-R demonstrates a consistent factor structure across cultures.

Studies examining levels of optimism across Eastern and Western cultures have also demonstrated varying results. In a recent study examining levels of optimism across 142 countries, Japan was among the ten countries with the lowest optimism, or positive expectations for the future (Gallagher et al., 2013). In fact, Japan was the only country in which individuals on average did not have more positive expectations for their future compared to their present level of life satisfaction. Similarly, average levels of optimism were found to be lowest in Japan in a meta-analysis comparing 22 countries (Fischer & Chalmers, 2008). Other research has focused on comparing patterns of dispositional generalized outcome expectancies across those with Eastern and Western cultural backgrounds. However, findings may be influenced by the way optimism is measured. One of the earliest studies found that Asian Americans were comparatively less optimistic than Caucasian Americans when dispositional optimism was measured as a unidimensional construct (Chang, 1996b). When optimism and pessimism have been treated as separate constructs, Asian Americans often appear comparatively more pessimistic than Caucasian Americans, while levels of optimism are consistent (Chang, 1996a, 1996b; Hardin & Leong, 2005). In addition, observed differences may depend on the domain being examined. Asian American college students in the United States of America (US) have shown similar levels of optimism regarding their performance in the social domain (e.g. maintaining positive relationships, expressing themselves, and achieving social goals) compared to Caucasian students, but greater pessimism regarding their emotional reactions to social interactions (e.g. feeling guilt and anxiety; Zane et al., 1991). Furthermore, Westerners tend to demonstrate "unrealistic optimism," predicting that positive events are more likely to occur for themselves as opposed to others, while those from Eastern cultures show the opposite pattern, perhaps because self-enhancement may not be congruent with collectivist or interdependent cultural ideals (Chang & Asakawa, 2003; Chang et al., 2001; Heine & Lehman, 1995). Therefore, it would be important to assess measurement invariance across cultures.

The present study examined the factor structure and measurement invariance of the LOT-R across American and Japanese adults in order to clarify previously observed differences in levels of optimism and pessimism across Western and Eastern cultures. Prior research comparing dispositional optimism in Western and Eastern cultures has predominantly utilized student samples and examined different racial/ethnic groups within the US. The current study enhanced generalizability by employing representative samples of the populations of the US and the Japanese capital city. The first aim of the study was to examine the factor structure of optimism within both samples in order to determine whether a 1-factor or 2-factor model demonstrated the best fit. The second aim was to directly examine the measurement invariance of the LOT-R across samples. It was hypothesized that the more parsimonious 1-factor structure of optimism would demonstrate the best fit in both samples given that optimism was originally conceptualized as a unidimensional construct during the development of the scale, and because the LOT-R is a previously validated, widely used measure in the optimism literature. It was also hypothesized that the LOT-R would demonstrate measurement invariance, which is an underlying assumption of prior cross-cultural research using this scale. In addition, we expected that levels of optimism would be lower in the Japanese sample, consistent with prior research.

1 Method

1.1 Participants

The current study included 1805 American adults and 1027 Japanese adults from the Midlife Development in the US (MIDUS) and Midlife Development in Japan (MIDJA) studies. The American sample was 45.3% male, and ages ranged from 30 to 84 (M = 56.85, SD = 12.62). The Japanese sample was 49.2% male and ages ranged from 30 to 79 (M = 54.4, SD = 14.15). In terms of marital status, 68.8% of the American sample was married (with 31.0% unmarried), while 70.3% of the Japanese sample was married (with 29.3% unmarried). Additional demographic information is provided in Table 1.

1.2 Procedures

Data from the second wave of the MIDUS as well as the first wave of MIDJA were utilized for the present study. Participants from the first wave of the original MIDUS study in the US

Table 1 *Demographics Information for the American and Japanese Samples*

Variable	US	Japan
Age (M, SD)	56.85, 12.62	54.36, 14.15
Gender (%)		
Male	45.3	49.2
Female	54.7	50.8
Marital Status (%)		
Married	68.8	70.5
Unmarried	31.0	29.3
Racial Origins (%)		
White	89.4	
Black and/or African American	4.9	
Native American or Alaska Native Aleutian Islander/Eskimo	1.7	
Asian	0.6	
Native Hawaiian or Pacific Islander	0.1	
Other	2.8	
Spanish/Hispanic/Latino Descent		
No	95.7	
Yes	3.8	
Highest Level of Education (%)		
No School/Some Grade School (1–6)	0.4	
8th Grade/Junior High School (7–8)	1.5	9.4
Some High School (9–12)	5.2	3.2
High School Graduate Equivalency Degree	1.3	–
Graduated From High School	25.9	29.8
Some College	20.8	2.5
Graduated from 2-Year College, Vocational School, or Associate Degree	7.8	22.2
Graduated from A 4- or 5- Year College, or Bachelor's Degree	18.8	29.2
Graduate School	18.2	2.4

Note. For the American sample, the category Graduate School incorporates the subcategories of some graduate school, master's degree, and other professional degrees [e.g., Doctor of Philosophy (PH.D)., Doctor of Medicine (M.D.), Juris Doctor (J.D), ect.]. Blank lines indicate that a certain category was not present for one of the samples.

(MIDUS1) were recruited by random digit dialing to obtain a nationally representative main sample of English-speaking adults during the period of 1995–6. Participants completed a 30-min telephone interview and were mailed two self-administered questionnaires assessing aspects of their mental and physical health. For the second wave of the study (MIDUS2) during 2004–6, participants who completed at least the telephone interview for MIDUS1 were invited to complete a second battery of measures with minor alterations, including the addition of the Life Orientation Test-Revised. The American sample utilized in the present study consisted of the main sample of the MIDUS2 who completed the self-administered questionnaires after the second telephone interview, consisting of 52% of the main sample from the MIDUS1 and 80% of MIDUS2 phone interview completers. Respondents were compensated with $20 for participating in the MIDUS1 and $60 for completing all waves of the study. Recruitment for the first wave of the MIDJA was conducted in Tokyo, Japan from April–September 2008. Individuals were selected from the Basic Resident Register Book using stratified random sampling by age and gender to obtain a representative sample of Japanese-speaking residents of the 23 wards of Tokyo. Participants were mailed a recruitment package with instructions and offered 3000 yen (approximately $27–30 at the time the survey was conducted) to participate.

1.3 Measure

Dispositional Optimism was measured with the revised version of the Life Orientation Test (LOT-R) developed by Scheier et al. (1994). An English version was used for the American sample and a Japanese version was used for the Japanese sample. The original English version of the scale was translated into Japanese, back translated, and adjusted by native Japanese speakers in order to achieve equivalent meanings. The LOT-R is comprised of 3 positively worded items (which are sometimes used to yield an "optimism" subscore) and 3 negatively worded items (which are sometimes used to yield a "pessimism" subscore), as well as four filler items that were not included in the MIDUS study. The negatively worded items were designed to be reverse coded when calculating the total dispositional optimism score from all 6 items. For the 2-factor model, negatively worded items were not reverse coded given that they were loaded onto a separate pessimism factor. However, the original reverse scoring conventions were used for the negatively worded items in the unidimensional 1-factor model. The response options provided in the MIDUS study (1 = Agree a lot, 2 = Agree a little, 3 = Neither agree nor disagree, 4 = Disagree a little, 5 = Disagree a lot) differed slightly from the original LOT-R response options. The internal consistency for the full LOT-R was $\alpha = .80$ in the American sample and $\alpha = .63$ in the Japanese sample. Furthermore, internal consistency was $\alpha = .69$ for the optimism item set and $\alpha = .81$ for the pessimism item set within the American sample. In the Japanese sample, internal consistency was $\alpha = .58$ for the optimism item set and $\alpha = .51$ for the pessimism item set.

1.4 Analytic Plan

Descriptive statistics were calculated using IBM SPSS version 24.0. Means and standard deviations of optimism and pessimism scores and total dispositional optimism scores were calculated for both samples. The correlation between the optimism and pessimism scores was also computed.

Study hypotheses were tested with structural equation modeling (SEM) using Mplus version 8.0 (Muthén & Muthén, 1998–2017). Fit was evaluated for each model using common indices including χ^2, the Root Mean Square Error (RMSEA), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and the Standardized Root Mean Square Residual (SRMR). The Satorra-Bentler scaled χ^2(Satorra & Bentler, 1988) was also employed when assessing measurement invariance, which is appropriate when using robust maximum likelihood estimation for non-normal data. Models generally demonstrate an acceptable fit to the data if the RMSEA and SRMR are below .08 (Hu & Bentler, 1999; MacCallum et al., 1996), the CFI and TLI are above .90 (Brown, 2015; Kline, 2005), and the χ^2 is non-significant at $\alpha = .05$ (Bollen, 1989). However, the χ^2 is highly sensitive to sample size, and other common indices such as the CFI and TLI are often preferred when utilizing larger samples (Bergh, 2015). The robust maximum likelihood (MLR) estimator was also used, which addresses missing data by means of full information maximum likelihood estimation. In addition, to set the scale for each latent variable and allow for model identification, the factor loading of one referent indicator was constrained to 1.00, which is a preferable method when examining measurement invariance (Johnson et al., 2009).

Confirmatory factor analysis (CFA) was used to examine the 1-factor unidimensional model of optimism and the 2-factor model with separate latent constructs for optimism and pessimism within each sample (see Fig. 1). Next, multiple-group CFA was used to determine whether the LOT-R demonstrated measurement invariance across the American and Japanese samples. Given that the same 2-factor structure emerged in both samples, measurement invariance was examined using this configuration. Three nested models with increasingly strict criteria were examined in succession to determine configural, weak, and strong factorial invariance (Little, 2013), so that with each step, additional model parameters were constrained as equal (i.e. factor structure, item loadings, and item intercepts). Configural invariance occurs when the factor structure and patterns of fixed and free parameters are consistent across samples (Cheung & Rensvold, 2002). This was determined by examining model fit as reflected by the χ^2, RMSEA, CFI, TLI, and SRMR. Weak invariance occurs when factor loadings of items onto latent constructs are equivalent across the samples. Weak invariance was evidenced if the Satorra-Bentlerχ^2 difference test between models was non-significant at $\alpha = .005$, if the change in CFI between the models was less than .01, and the RMSEA values of both models fell within each other's confidence intervals (and thus were not significantly different; Cheung & Rensvold, 2002). The same criteria was used to determine strong invariance, which was achieved if the indicator means were equivalent across the samples (Cheung & Rensvold, 2002). When full invariance weas not achieved, it was explored whether the LOT-R demonstrated partial weak and partial strong invariance (Steenkamp & Baumgartner, 1998). Parameters with the highest modification indices were sequentially freed so that they were no longer constrained as equal between samples until the model fit reached acceptable levels, which would indicate partial invariance. These parameters remained freed in subsequent models (i.e., factor loadings that were not constrained as equal when examining partial weak invariance were similarly freed when examining partial strong invariance, and intercepts for these items were not constrained as equal).

Finally, group differences in optimism and pessimism were examined. The effect size of the difference in means (Cohen's d) between the samples with 95% confidence intervals were calculated. An effect size of $d = .8$ indicated a large effect size, $d = .5$ indicated a moderate effect size, and $d = .2$ indicated a small effect size (Cohen, 1988). In addition, a SEM model was used to examine group differences in latent optimism and pessimism. Estimates for this

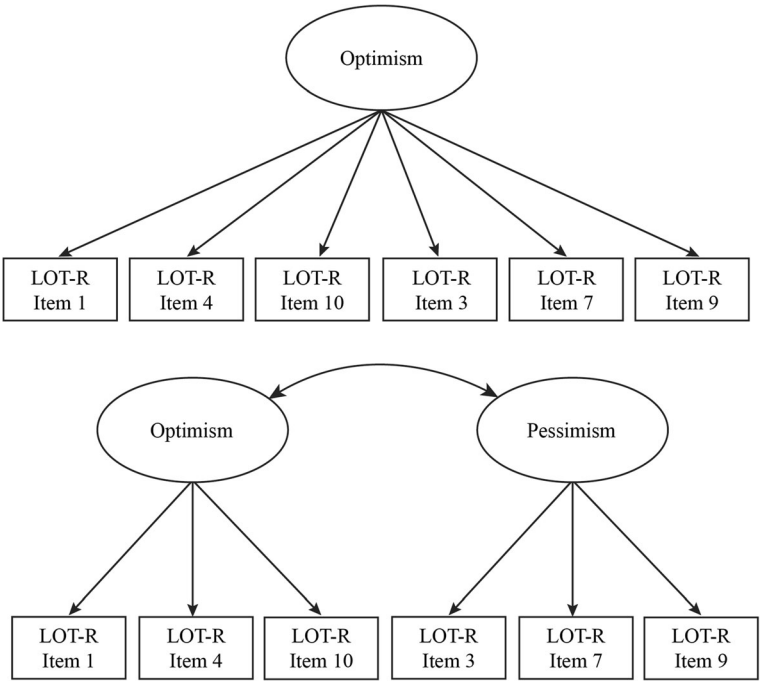

Fig. 1 Two potential optimism models are depicted. The 1-factor conceptualization of optimism (top) is composed of the 6 non-filler items from the LOT-R. The 2-factor conceptualization (bottom) includes separate latent factors of optimism and pessimism composed of 3 items each

model were y-standardized given that cultural group was modeled as a binary predictor (0 = American, 1 = Japanese) of these outcomes.

2 Results

2.1 Descriptive Statistics

Means, standard deviations, and mean differences are provided for each study variable in Table 2. The correlation between these optimism and pessimism scores was $r = -.47$, $p < .001$ in the American sample, and $r = -.32$, $p < .001$ in the Japanese sample. Inter-item correlations are provided in Table 3.

2.2 Comparison of Optimism Models

The factor structure of optimism was examined in each respective sample using CFA in order to determine which model demonstrated the best fit and would be used in subsequent analyses. The model fit for the 1-factor model of optimism was unacceptable in both samples, though model fit was slightly better in the American sample (χ^2 (df = 9) = 368.57, $p < .05$, RMSEA = .149 [.136, .162], CFI = .83, TLI = .71, SRMR = .08) compared to the Japanese sample (χ^2 (df = 9) = 127.07, $p < .05$, RMSEA = .113 [.096, .131], CFI = .77, TLI = .62, SRMR

Table 2 Descriptive Statistics and Mean Differences Between Samples

	US			Japan			*d*	95% CI	
Variable	*n*	*M*	*SD*	*n*	*M*	*SD*			
Total Optimism	1793	23.05	4.77	1024	19.40	3.59	0.83	0.75	0.91
Optimism Subscale	1793	11.80	2.46	1023	10.00	2.22	0.76	0.68	0.84
Pessimism Subscale	1793	6.75	3.09	1023	8.60	2.20	−0.66	−0.74	−0.58

Note. d = Cohen's d

= .06). The model fit for the 2-factor model was superior to the 1-factor model fit in both samples, though it only demonstrated acceptable levels for all four indicators in the American sample (American sample: χ^2 (df = 8) = 105.02, $p < .05$, RMSEA = .082 [.069, .097], CFI = .95, TLI = .91, SRMR = .04; Japanese sample: χ^2 (df = 8) = 63.03, $p < .05$, RMSEA = .082 [.064, .101], CFI = .90, TLI = .80, SRMR = .04). The correlation between latent optimism and pessimism was $r = -.64$, $p < .001$ in the American sample, and $r = -.60$, $p < .001$ in the Japanese sample. Given that the 2-factor structure demonstrated a superior fit compared to the 1-factor model in both samples, this model was retained for the subsequent measurement invariance analysis.

Table 3 LOT-R Item Level Means and Correlations in the Japanese and American Samples

		M	*SD*	Correlation Coefficients Pearson's *r*				
				Item 1	Item 4	Item 10	Item 3	Item 7
Japan	***Optimism***							
	1. In uncertain times, I usually expect the best	3.36	1.00	1				
	4. I'm always optimistic about my future	3.35	1.07	.27***	1			
	10. I expect more good things to happen to me than bad	3.29	0.93	.25***	.43***	1		
	Pessimism							
	3.If something can go wrong for me, it will	2.70	.98	.06*	−.10**	−.25***	1	
	7. I hardly ever expect things to go my way	3.07	1.07	−.09**	−.22***	−.27**	.23***	1
	9. I rarely count on good things happening to me	2.83	1.04	−.16***	−.23***	−.30**	.10***	.43***
US	***Optimism***							
	1. In uncertain times, I usually expect the best	3.73	1.10	1				
	4. I'm always optimistic about my future	3.91	1.03	.48***	1			
	10. I expect more good things to happen to me than bad	4.15	1.01	.37***	.42***	1		
	Pessimism							
	3. If something can go wrong for me, it will	2.47	1.27	−.21***	−.31***	−.34***	1	
	7. I hardly ever expect things to go my way	2.12	1.15	−.24***	−.35***	−.45***	.57***	1
	9. I rarely count on good things happening to me	2.16	1.22	−.21***	−.32***	−.44***	.50***	.69***

LOT-R = Life Orientation Test-Revised; * $p < .05$; ** $p < .01$; *** $p < .001$.

2.3 Measurement Invariance

Next, measurement invariance analysis was conducted using the 2-factor model of optimism (See Table 4). The 2-factor model of optimism demonstrated evidence of configural invariance across both samples, reflecting a generally acceptable model fit with acceptable values for two out of four model fit indices and borderline acceptable values for the remaining model fit indices (χ^2 (df = 16) = 168.48, $p < .05$, RMSEA = .082 [.071, .094], CFI = .94, TLI = .89, SRMR = .04). This suggests that the factor structure of optimism is consistent across the samples. The correlation between latent optimism and pessimism was $r = -.64$ in the American sample, and $r = -.60$ in the Japanese sample. For the weak invariance test, two out of four model fit indices demonstrated acceptable values, and the remaining values demonstrated borderline acceptable values (χ^2 (df = 20) = 216.99, $p < .05$, RMSEA = .084 [.074, .094], CFI = .93, TLI = .89, SRMR = .06). However, the 2-factor model of optimism did not demonstrate full weak invariance, as indicated by the significant Satorra-Bentler χ^2 difference test (scaled χ^2 (df = 4) = 48.16, $p < .001$), even though the change in CFI between the models was less than .01 and the RMSEA values of the nested models fell within each other's confidence intervals. Simulation research has indicated that change in CFI and RMSEA may not identify true weak non-invariance when there is an imbalance in sample size between groups (Yoon & Lai, 2018), as was the case in the present study. Furthermore, the chi-squared difference test is a more direct statistical test of model differences. Thus, the chi-squared difference test may be a more accurate test of weak invariance under these circumstances. The correlation between latent optimism and pessimism was $r = -.65$ in the American sample, and $r = -.63$ in the Japanese sample.

Given that a number of model fit indices reached acceptable levels for the weak invariance model, it was examined whether the LOT-R demonstrated partial weak invariance. LOT-R items 1 and 3 (corresponding to the first item of both the optimism and pessimism item sets respectively) demonstrated the largest modification indices and weaker factor loadings compared to other items, particularly in the Japanese sample ($\lambda = .53$ for LOT-R item 1, $\lambda = .63$ for LOT-R item 3 in the American sample; $\lambda = .48$ for LOT-R item 1, $\lambda = .46$ for LOT-R item 3 in the Japanese sample). Partial weak invariance was demonstrated when the factor loadings of LOT-R item 1 ("In uncertain times, I usually expect the best") and LOT-R item 3 ("If something can go wrong for me, it will") were not constrained as equal across samples (χ^2 (df = 18) = 163.99, $p < .05$, RMSEA = .076 [.065, .087], CFI = .95, TLI = .91, SRMR = .04, and scaled χ^2 (df = 2) = .25, $p = .88$ for the difference test; See Table 5). This suggests that the relationships between the remaining LOT-R items and their associated latent constructs are consistent across cultures, while LOT-R items 1 and 3 do not relate to optimism and

Table 4 *Measurement Invariance Analysis Results*

Model	χ2	*df*	CFI	TLI	RMSEA [90% CI]	SRMR	Models	Δ χ2	Δ *df*	*p*
1. Configural	168.48	16	.943	.894	.082 [.071, .094]	.040				
2. Weak	216.99	20	.927	.890	.084 [.074, .094]	.059	1 & 2	48.16	4	<.001
3. Partial Weak	163.99	18	.946	.910	.076 [.065, .087]	.040	1 & 3	.25	2	.88
4. Partial Strong	735.72	22	.735	.669	.152 [.142, .161]	.180	3 & 4	669.37	4	<.001

Note. χ^2 = Chi-squared; *df* = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis fit index; RMSEA = Root Mean Square Error of Approximation; CI = 90% confidence intervals; Δ χ2 = Satorra-Bentler scaled Chi-squared value for difference testing; Δ *df* = difference in degrees of freedom; p value for chi-squared difference test

pessimism consistently across the samples. The correlation between latent optimism and pessimism was $r = -.61$ in the American sample and $r = -.64$ in the Japanese sample.

The 2-factor model of optimism with factor loadings and intercepts for LOT-R items 1 and 3 left unconstrained as equal did not demonstrate partial strong invariance. All four model fit indices showed poor model fit (χ^2 (df = 22) = 735.72, $p < .05$, RMSEA = .152 [.142, .161], CFI = .735, TLI = .669, SRMR = .180, and scaled χ^2 (df = 4) = 669.37, $p < .001$ for the difference test), the Satorra-Bentler χ^2 difference test between the nested models was statistically significant, the change in CFI was greater than .01, and RMSEA values that did not fall within each other's confidence intervals. This indicates that any differences in levels of

Table 5 Factor Loadings and Item Intercepts for LOT-R Items in the Partial Weak Invariance Model and Partial Strong Invariance Model

Item	US				Japan			
	Unstd Loading	Std Loading	Unstd Intercept	Std Intercept	Unstd Loading	Std Loading	Unstd Intercept	Std Intercept
Partial Weak Measurement Invariance								
Optimism								
1. In uncertain times, I usually expect the best	0.92	.58	3.73	3.41	0.56	.37	3.36	3.36
4. I'm always optimistic about my future[a]	1.00	.67	3.91	3.79	1.00	.61	3.35	3.12
10. I expect more good things to happen to me than bad	1.00	.69	4.15	4.11	1.00	.71	3.29	3.56
Pessimism								
3. If something can go wrong for me, it will	0.84	.66	2.48	1.95	0.40	.28	2.70	2.75
7. I hardly ever expect things to go my way[a]	1.00	.87	2.12	1.85	1.00	.65	3.07	2.88
9. I rarely count on good things happening to me	0.96	.78	2.16	1.77	0.96	.64	2.83	2.71
Strong Measurement Invariance Model								
Optimism								
1. In uncertain times, I usually expect the best	0.93	.58	3.56	3.20	0.54	.40	3.56	3.49
4. I'm always optimistic about my future[a]	1.00	.66	3.72	3.56	1.00	.66	3.72	3.25
10. I expect more good things to happen to me than bad	1.13	.74	3.84	3.62	1.13	.80	3.84	3.58
Pessimism								
3. If something can go wrong for me, it will	0.81	.67	2.72	2.11	0.36	.32	2.55	2.56
7. I hardly ever expect things to go my way[a]	1.00	.88	2.47	2.05	1.00	.72	2.47	2.04
9. I rarely count on good things happening to me	0.92	.79	2.44	1.96	0.92	.71	2.44	2.16

Note.[a] Unstandardized factor loading fixed at one for model identification - other factor loadings with values of 1 are due to rounding to two decimal places, Std = Standardized, Unstd = Unstandardized. Fit statistics for partial weak invariance model: χ^2 (df = 17) = 163.99, $p < .05$, RMSEA = .076 [.065, .087], CFI = .946, TLI = .910, SRMR = .040, and scaled χ^2 (df = 2) = .25, $p = .88$ for the difference test; Fit statistics for partial strong invariance model: χ^2 (df = 22) = 735.72, $p < .05$, RMSEA = .152 [.142, .161], CFI = .735, TLI = .669, SRMR = .180, and scaled χ^2 (df = 4) = 669.37, $p < .001$ for the difference test

optimism and pessimism across these cultures are, to a certain degree, influenced by the measurement properties of the LOT-R.

2.4 Group Differences in Optimism and Pessimism

Comparisons of observed group means revealed that Japanese adults demonstrated lower levels of optimism (d = .76 [.68, .84]) and higher levels of pessimism (d = −.66 [−.74, −.58]) than American adults, with medium-to-large effect sizes (See Table 2). The model fit for the SEM model examining group differences in optimism and pessimism was acceptable (χ^2 (df = 12) = 229.19, p < .05, RMSEA = .080 [.071, .089], CFI = .94, TLI = .90, SRMR = .04). The results indicated that levels of latent optimism were lower in the Japanese sample compared to the American sample, and this effect size was large (β = −.94 [−1.02, −.86]). Similarly, the Japanese sample showed higher levels of pessimism compared to the American sample, with a large effect size (β = .82 [.75, .90]). However, these results must be interpreted with caution given that the LOT-R demonstrated partial weak invariance but not partial strong invariance, which suggests that observed group differences may be partially accounted for by differences in the measurement properties of the scale across cultures. The correlation between optimism and pessimism was r = −.64, p < .001.

3 Discussion

The findings from the present study indicate that the 2-factor structure representing distinct optimism and pessimism factors showed the best fit within both the American and Japanese samples. The 2-factor configuration of the LOT-R demonstrated partial weak invariance across samples when the factor loadings of LOT-R items 1 and 3 were not constrained as equal. Analyses examining group differences in generalized outcome expectancies indicated that Japanese adults demonstrated lower levels of optimism and higher levels of pessimism, and both effect sizes were medium-to-large in magnitude.

Results from the factor structure analysis suggest that optimism and pessimism are better conceptualized as distinct latent constructs, as opposed to opposite poles of a unitary construct representing generalized outcome expectancies. The 2-factor structure of the LOT-R representing separate latent constructs of optimism and pessimism demonstrated a superior fit to the 1-factor unidimensional model across both samples. Thus, the hypothesis that the LOT-R would exhibit a 1-factor structure was not supported. The results suggested that the factors representing optimism and pessimism were distinct but strongly associated. Though the latent correlation between optimism and pessimism in the 2-factor model was large in magnitude in both samples, it was not large enough to suggest complete redundancy between the constructs. Dispositional optimism was originally conceptualized as a unidimensional-bipolar construct constituting trait-like generalized outcome expectancies, with pessimism representing one pole and optimism representing the opposing pole. While the corresponding 1-factor structure of the LOT and LOT-R has generally been well-supported in the literature, other studies have indicated a 2-factor structure of the LOT and LOT-R with separate factors of optimism and pessimism (Chang et al., 1994; Creed et al., 2002; Lai & Yue, 2000; Lai, 1994; Lui et al., 2016). While it is possible that such findings reflect a methodological confound given the negative wording of pessimism items (Scheier & Carver, 1985), there is some evidence that optimism and pessimism demonstrate different relationships with mental health outcomes in both Eastern and Western samples, and thus may represent separate constructs (Chang, 1997; Chang et al., 1994; Marshall et al., 1992). Future research should continue

to examine whether optimism and pessimism are associated with different outcomes in additional contexts in order to fully establish whether they are separate constructs.

Furthermore, the LOT-R demonstrated partial weak invariance, indicating that the relationships between certain items and their requisite constructs were not consistent across cultures. This partially supports the hypothesis that the LOT-R would demonstrate measurement invariance across cultures. The factor loadings of LOT-R item 1 ("In uncertain times, I usually expect the best") and LOT-R item 3 ("If something can go wrong for me, it will") were not equivalent across cultures. The items were less strongly associated with their latent constructs in the Japanese sample compared to the American sample, though factor loadings were generally weak across culture. While some studies have demonstrated more acceptable factor loading values for these LOT-R items when this scale has been administered to Japanese samples (Nakano, 2004; Sumi, 2004), other research comparing the properties of the measurement LOT-R across Eastern and Western cultures encountered problems with LOT-R item 1 in an East Asian sample (Bieda et al., 2017).

It is important to consider why LOT-R items 1 and 3 were not equivalent across cultures. The wording of LOT-R item 3 appears similar to the wording of the adage referred to as "Murphy's Law," which is well known in American culture. In fact, the conceptual link between optimism-pessimism and "Murphy's Law" is significant enough that it inspired the title of a self-help book by a prominent optimism researcher ("Breaking Murphy's Law"; Segerstrom, 2006). It may be speculated that the wording of the pessimism item could be more familiar and salient to Americans and may have been more difficult to translate into the Japanese version of the LOT-R. It may also be speculated that cultural differences in the factor loadings of LOT-R item 1 may stem from the explicit mention of positive expectations in uncertain conditions. Japanese individuals have been shown to have among the highest levels of uncertainty avoidance compared to other countries, demonstrating discomfort with uncertain conditions (Hofstede, 1980; Hofstede, 2001). As a result, Japanese adults may spend a greater amount of time preparing for the future and preventing negative outcomes. Thus, Japanese adults may be more cautious when making optimistic predictions about explicitly uncertain conditions. Additional research examining cultural differences associated with non-equivalent items will help elucidate the reasons for differential item functioning.

While the 2-factor model demonstrated partial weak invariance across the samples, this model did not demonstrate partial strong invariance. This suggests that the same scores on LOT-R items do not reflect an identical degree, intensity, or magnitude of optimism across the samples. Opinions vary regarding the degree of measurement invariance that is necessary when making group mean comparisons. Some propose that configural invariance will suffice, as even weak invariance is overly stringent (Horn & McArdle, 1992), while others argue that partial weak invariance is more appropriate (Byrne, 2006). In the present study, group differences in levels of optimism and pessimism were relatively large and the associated subscales demonstrated partial weak invariance, so there are likely true group differences in levels of optimism and pessimism.

These results indicated that Japanese adults demonstrated lower levels of optimism and higher levels of pessimism than American adults. These results must be interpreted with caution given that the LOT-R did not demonstrate partial strong invariance, which is ideal when comparing mean scores in cross-cultural research. Still, some information may be gleaned from these results as there appear to be relatively large differences in optimism and pessimism across these cultures, which would suggest that measurement bias cannot fully account for group differences.

These results are consistent with the hypothesis that Japanese adults would demonstrate lower levels of optimism, as well as previous studies indicating that Japanese adults have lower levels of optimism compared to adults of other nationalities, particularly those from Western nations (Gallagher et al., 2013; Fischer & Chalmers, 2008). Studies utilizing the 2-factor model of optimism have also shown that Asian Americans have greater levels of pessimism compared to Caucasian Americans, consistent with the present study (Chang, 1996a, 1996b; Hardin & Leong, 2005). However, these studies indicated that levels of optimism were consistent across individuals from both Caucasian and Asian ethnic backgrounds living in a Western cultural context. Thus, there may be differences in optimism between people with Asian ethnic backgrounds living in Western countries and those who are native or residing in Asia, so generalization between these two groups may be ill advised.

3.1 Strengths and Limitations

A major strength of the present study was the use of large, representative samples, which contributed to increased statistical power and generalizability of results. Previous studies examining levels of optimism across East Asian and Western cultures generally relied on smaller samples of college students. However, in the present study, the Japanese sample was representative of the capital city of Tokyo and not representative of the entire country of Japan. Thus, other regions of the country, including more rural areas, were not represented. Furthermore, structural equation modeling was utilized, which accounts for measurement error when assessing the properties of scales and group differences, and the cross-cultural equivalence of the scales was examined using multiple group CFA. This method allows for the direct examination of assumptions that constructs of interest and the measurement properties of associated scales are invariant across the different samples, which can help to clarify the degree to which group differences are influenced by measurement artifacts. However, this method cannot quantify the exact degree to which group differences are impacted by measurement properties of the scales. Furthermore, the present study utilized a well-established measure of optimism, the LOT-R, and focused on three factor structures of optimism. While the present study compared the most prominent models of optimism across the American and Japanese samples, other model configurations of optimism have been examined in the broader literature, including models that attempt to account for method factors associated with wording artifacts (Alessandri et al., 2010).

3.2 Future Directions and Practical Implications

The results from the present study indicated that the 2-factor structure of the LOT-R demonstrated a better fit than the 1-factor structure in both samples, suggesting that optimism and pessimism are distinct but related constructs. Additional research examining whether optimism and pessimism show different relationships with mental health outcomes will help determine the nature of these dispositional generalized outcome expectancies. The LOT-R also demonstrated partial weak invariance but not partial strong invariance, indicating that mean differences in optimism between the US and Japan can, to a certain degree, be attributed to the measurement properties of the scale. Thus, these problems must be addressed in future cross-cultural research focusing on these populations. Item response theory could be employed to better characterize the differential item functioning for LOT-R items 1 and 3. Alternatively, new culturally equivalent items could be developed as replacements.

In addition, the present study focused on cross-cultural comparisons between the US and Japan on the national level. Though there is a significant amount of cultural and ethnic heterogeneity within the United States, the current study sample was 89% Caucasian American and included less than 1% Asian Americans compared to the more homogenous population of Japan. It is possible that the measurement properties of the LOT-R may differ between Americans of different ethnic and racial backgrounds. Future research could also examine whether optimism functions consistently across different racial and ethnic groups within the US, particularly among minority populations for which there is a lack of research (e.g. Latinx, African American, and Native American).

4 Conclusions

Overall, the results from the present study supported a 2-factor structure of the LOT-R, which suggests that optimism and pessimism are distinct but related constructs, and the measurement invariance analyses revealed partial weak invariance of the LOT-R. In addition, Japanese adults showed lower levels of optimism and lower levels of pessimism compared to American adults, with both differences demonstrating moderate-to-large effect sizes. While these differences may be influenced by the measurement properties of the LOT-R, the relatively large magnitude of the effects suggests that there are true differences in levels of optimism and pessimism across these cultures. Further examination of the relationships of optimism and pessimism with mental health outcomes will help determine whether optimism and pessimism function similarly as separate constructs in both cultures.

Declarations

Ethical Approval All procedures performed in studies involving human participants were in accordance with. the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.
This article does not contain any studies with animals performed by any of the authors.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Conflict of Interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

Alarcon, G. M., Bowling, N. A., & Khazon, S. (2013). Great expectations: A meta-analytic examination of optimism and hope. *Personality and Individual Differences, 54*(7), 821–827. https://doi.org/10.1016/j.paid.2012.12.004

Alessandri, G., Vecchione, M., Fagnani, C., Bentler, P. M., Barbaranelli, C., Medda, E., Nisticò, L., Stazi, M. A., & Caprara, G. V. (2010). Much more than model fitting? Evidence for the heritability of method effect associated with positively worded items of the life orientation test revised. *Structural Equation Modeling, 17*(4), 642–653. https://doi.org/10.1080/10705511.2010.510064

Bergh, D. (2015). Chi-squared test of fit and sample size - A comparison between a random sample approach and a chi-square value adjustment method. *Journal of Applied Measurement, 16*(2), 204–217.

Bieda, A., Hirschfeld, G., Schönfeld, P., Brailovskaia, J., Zhang, X. C., & Margraf, J. (2017). Universal happiness? Cross-cultural measurement invariance of scales assessing positive mental health. *Psychological Assessment, 29*(4), 408–421. https://doi.org/10.1037/pas0000353

Bollen, K. A. (1989). *Structural equations with latent variables*. Wiley.
Brown, T. A. (2015). *Confirmatory factor analysis for applied research* (2nd ed.). The Guilford Press.
Byrne, B. M. (2006). *Structural equation modeling with EQS: Basic concepts, applications, and programming* (2nd ed.). Lawrence Erlbaum Associates Publishers.
Carver, C. S., Blaney, P. H., & Scheier, M. F. (1979). Focus of attention, chronic expectancy, and responses to a feared stimulus. *Journal of Personality and Social Psychology, 37*(7), 1186–1195. https://doi.org/10.1037/0022-3514.37.7.1186
Carver, C. S., Scheier, M. F., & Segerstrom, S. C. (2010). Optimism. *Clinical Psychology Review, 30*(7), 879–889. https://doi.org/10.1016/j.cpr.2010.01.006
Chang, E. C. (1996a). Evidence for the cultural specificity of pessimism in Asians vs Caucasians: A test of a general negativity hypothesis. *Personality and Individual Differences, 21*(5), 819–822. https://doi.org/10.1016/0191-8869(96)00110-9
Chang, E. C. (1996b). Cultural differences in optimism, pessimism, and coping: Predictors of subsequent adjustment in Asian American and Caucasian American college students. *Journal of Counseling Psychology, 43*(1), 113–123. https://doi.org/10.1037/0022-0167.43.1.113
Chang, E. (1997). Optimism and pessimism as partially independent constructs: Relationship to positive and negative affectivity and psychological well-being. *Personality and Individual Differences, 23*(3), 433–440. https://doi.org/10.1016/S0191-8869(97)00040-8
Chang, E. C., & Asakawa, K. (2003). Cultural variations on optimistic and pessimistic bias for self versus a sibling: Is there evidence for self-enhancement in the west and for self-criticism in the east when the referent group is specified? *Journal of Personality and Social Psychology, 84*(3), 569–581. https://doi.org/10.1037/0022-3514.84.3.569
Chang, E. C., Asakawa, K., & Sanna, L. J. (2001). Cultural variations in optimistic and pessimistic bias: Do easterners really expect the worst and westerners really expect the best when predicting future life events? *Journal of Personality and Social Psychology, 81*(3), 476–491. https://doi.org/10.1037/0022-3514.81.3.476
Chang, E. C., D'Zurilla, T. J., & Maydeu-Olivares, A. (1994). Assessing the dimensionality of optimism and pessimism using a multimeasure approach. *Cognitive Therapy and Research, 18*(2), 143–160. https://doi.org/10.1007/BF02357221
Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal, 9*(2), 233–255. https://doi.org/10.1207/S15328007SEM0902_5
Chiesi, F., Galli, S., Primi, C., Innocenti Borgi, P., & Bonacchi, A. (2013). The accuracy of the life orientation test–revised (LOT–R) in measuring dispositional optimism: Evidence from item response theory analyses. *Journal of Personality Assessment, 95*(5), 523–529. https://doi.org/10.1080/00223891.2013.781029
Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* Routledge Academic.
Creed, P. A., Patton, W., & Bartrum, D. (2002). Multidimensional properties of the lot-R: Effects of optimism and pessimism on career and well-being related variables in adolescents. *Journal of Career Assessment, 10*(1), 42–61. https://doi.org/10.1177/1069072702010001003
Fischer, R., & Chalmers, A. (2008). Is optimism universal? A meta-analytical investigation of optimism levels across 22 nations. *Personality and Individual Differences, 45*(5), 378–382. https://doi.org/10.1016/j.paid.2008.05.008
Gallagher, M. W., Lopez, S. J., & Pressman, S. D. (2013). Optimism is universal: Exploring the presence and benefits of optimism in a representative sample of the world. *Journal of Personality, 81*(5), 429–440. https://doi.org/10.1111/jopy.12026
Hardin, E. E., & Leong, F. T. L. (2005). Optimism and pessimism as mediators of the relations between self-discrepancies and distress among Asian and European Americans. *Journal of Counseling Psychology, 52*(1), 25–35. https://doi.org/10.1037/0022-0167.52.1.25
Heine, S. J., & Lehman, D. R. (1995). Cultural variation in unrealistic optimism: Does the west feel more vulnerable than the east? *Journal of Personality and Social Psychology, 68*(4), 595–607. https://doi.org/10.1037/0022-3514.68.4.595
Hofstede, G. (1980). *Culture's consequences: International differences in work-related values*. Sage.
Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*. Thousand oaks, CA: Sage (co-published in the PRC as Vol. 10 in the Shanghai foreign language education press SFLEP intercultural communication reference series, 2008).
Horn, J. L., & McArdle, J. J. (1992). A practical and theoretical guide to measurement invariance in aging research. *Experimental Aging Research, 18*(3–4), 117–144. https://doi.org/10.1080/03610739208253916
Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–55.
Huang, V., Lo, K. C., & Fiocco, A. J. (2019). Examining the factor structure and psychometric properties of the Chinese version of the life orientation test in older Chinese immigrants. Psychological Reports, *0*(0), 1–20. doi:https://doi.org/10.1177/0033294119868800.

Johnson, E. C., Meade, A. W., & DuVernet, A. M. (2009). The role of referent indicators in tests of measurement invariance. *Structural Equation Modeling, 16*(4), 642–657. https://doi.org/10.1080/10705510903206014
Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). The Guilford Press.
Kubzansky, L. D., Kubzansky, P. E., & Maselko, J. (2004). Optimism and pessimism in the context of health: Bipolar opposites or separate constructs? *Personality and Social Psychology Bulletin, 30*(8), 943–956. https://doi.org/10.1177/0146167203262086
Lai, J. C. L. (1994). Differential predictive power of the positively versus the negatively worded items of the life orientation test. *Psychological reports*, *75*(3_suppl), 1507–1515. doi: https://doi.org/10.2466/pr0.1994.75.3f.1507.
Lai, J. C. L., Cheung, H., Lee, W.-M., & Yu, H. (1998). The utility of the Revised Life Orientation Test to measure optimism among Hong Kong Chinese. *International Journal of Psychology, 33*(1), 45–56. https://doi.org/10.1080/002075998400600
Lai, J. C., & Yue, X. (2000). Measuring optimism in Hong Kong and mainland Chinese with the revised life orientation test. *Personality and Individual Differences, 28*(4), 781–796. https://doi.org/10.1016/S0191-8869(99)00138-5
Little, T. D. (2013). *Longitudinal structural equation modeling*. The Guilford Press.
Lui, P. P., Rollock, D., Chang, E. C., Leong, F. T. L., & Zamboanga, B. L. (2016). Big 5 personality and subjective well-being in Asian Americans: Testing optimism and pessimism as mediators. *Asian American Journal of Psychology, 7*(4), 274–286. https://doi.org/10.1037/aap0000054
MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Method, 1*, 130–149.
Marshall, G. N., Wortman, C. B., Kusulas, J. W., Hervig, L. K., & et al. (1992). Distinguishing optimism from pessimism: Relations to fundamental dimensions of mood and personality. Journal of Personality and Social Psychology, 62(6), 1067–1074. doi: https://doi.org/10.1037/0022-3514.62.6.1067.
Nakano, K. (2004). Psychometric properties of the Life Orientation Test-Revised in samples of Japanese students. *Psychological Reports*, *94*(3,Pt1), 849–855. doi: https://doi.org/10.2466/PR0.94.3.849-855.
Rand, K. L. (2018). Hope, self-efficacy, and optimism: Conceptual and empirical differences. In M. W. Gallagher & S. J. Lopez (Eds.), *The Oxford handbook of hope. (pp. 45–58)*. Oxford University Press.
Satorra, A., & Bentler, P. M. (1988). Scaling corrections for chi-square statistics in covariance structure analysis. In *American Statistical Association 1988 proceedings of the business and economic sections* (pp. 208–313). American Statistical Association.
Scheier, M. F., & Carver, C. S. (1982). Self-consciousness, outcome expectancy, and persistence. *Journal of Research in Personality, 16*(4), 409–418. https://doi.org/10.1016/0092-6566(82)90002-2
Scheier, M. F., & Carver, C. S. (1985). Optimism, coping, and health: Assessment and implications of generalized outcome expectancies. *Health Psychology, 4*(3), 219–247. https://doi.org/10.1037/0278-6133.4.3.219
Scheier, M. F., & Carver, C. S. (1992). Effects of optimism on psychological and physical well-being: Theoretical overview and empirical update. *Cognitive Therapy and Research, 16*(2), 201–228. https://doi.org/10.1007/BF01173489
Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the life orientation test. *Journal of Personality and Social Psychology, 67*(6), 1063–1078. https://doi.org/10.1037/0022-3514.67.6.1063
Segerstrom, S. C. (2006). *Breaking Murphy's law: How optimists get what they want from life and pessimists can too*. Guilford Press.
Snyder, C. R., Harris, C., Anderson, J. R., Holleran, S. A., Irving, L. M., Sigmon, S. T., Yoshinobu, L., Gibb, J., Langelle, C., & Harney, P. (1991). The will and the ways: Development and validation of an individual-differences measure of hope. *Journal of Personality and Social Psychology, 60*(4), 570–585. https://doi.org/10.1037/0022-3514.60.4.570
Steenkamp, J. E. M., & Baumgartner, H. (1998). Assessing measurement invariance in cross-national consumer research. *Journal of Consumer Research, 25*(1), 78–107. https://doi.org/10.1086/209528
Sumi, K. (2004). The Japanese version of the revised life orientation test: Reliability and construct validity. *Psychological Reports, 95*(1), 86–88. https://doi.org/10.2466/PR0.95.5.86-88
Yoon, M., & Lai, M. H. C. (2018). Testing factorial invariance with unbalanced samples. *Structural Equation Modeling, 25*(2), 201–213. https://doi.org/10.1080/10705511.2017.1387859
Zane, N. W., Sue, S., Hu, L., & Kwon, J. (1991). Asian-American assertion: A social learning analysis of cultural differences. *Journal of Counseling Psychology, 38*(1), 63–70. https://doi.org/10.1037/0022-0167.38.1.63