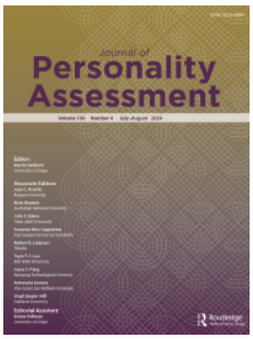

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Assessing Emotion Regulation across Asian and Western Cultures: Psychometric Properties of Three Common Scales across Singaporean and Australian Samples

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ABSTRACT

Given the differences in emotion regulation across cultures, it is paramount to ensure that measures of emotion regulation measure the same construct and that conceptualizations of emotion regulation are valid across cultures. Therefore, the present study assessed the measurement invariance (alongside other psychometric properties) of three popular emotion regulation questionnaires, the Emotion Regulation Questionnaire (ERQ), Difficulties in Emotion Regulation Scale (DERS), and the Perth Emotion Regulation Competency Inventory (PERCI), across 434 Singaporeans and 489 Australians. Our study showed that all three questionnaires were measurement invariant, had excellent internal consistency, and relatively good concurrent validity with psychopathology and alexithymia across our Singaporean and Australian sample, justifying their use in comparing Asian and Western cultures. Our findings suggest that measures of emotion regulation have utility across both individualistic and collectivistic cultures. Our findings supports the use of these measures in cross-cultural research and provides support for the utility for personality assessments across cultures.

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Research suggests that our culture heavily influences the way we regulate our emotions (Mesquita et al., 2013). In particular, researchers have shown interest in the differences between Asian and Western cultures because of their contrasting views on emotions. Asians are usually considered to have strong collectivist cultures where individuals view themselves in terms of their relationships and the role that they play in their community (Markus & Kitayama, 1991). On the other hand, Westerners are usually more individualistic where individuals view themselves as unique and therefore experience less pressure to conform to societal rules (Markus & Kitayama, 1991). These values have been found to influence how Asians and Westerners treat emotions and, in turn, choose emotion regulation strategies. For example, Asians have been found to use expressive suppression to regulate emotions more often than Westerners (Gross & John, 2003), likely because this strategy is perceived to be more in line with their role (e.g., a child or a father) and more considerate of others' feelings (Markus & Kitayama, 1991). The effects of expressive suppression have also been found to differ across cultures; where suppression resulted in poorer quality of social interaction (indicated by reduced smiling and laughing), increased perceived hostility, and increased reciprocal hostility during social interactions in Western samples as compared to Asian samples (Butler et al., 2007; See also: Soto et al., 2011). As a result, suppression may not be seen as a useful emotion regulation strategy from a Westerner's point of view.

Since past research has illuminated the cultural differences in emotion regulation, researchers are recognizing the need for evaluation of measurement invariance of the commonly used measures of this construct across cultures (Chen, 2008). Measurement invariance is a statistical technique that tells us if the construct can be broken down into the same components and if the same units can be used to measure the construct across groups (Chen, 2008). It can tell us if there are true differences in emotion regulation across cultures or if the differences are due to measurement variance. It could also inform us if both cultures conceptualize emotion regulation similarly (i.e., can emotion regulation be broken into the same components across cultures?). Presently, the current practice of validating a questionnaire across cultural groups using exploratory or confirmatory factor analyses merely tests for the lowest level of measurement invariance, i.e., configural invariance. Higher levels of invariance are necessary to show that emotion regulation can be measured using the same units across cultural groups and ensure accurate interpretation of the results. Determining the levels of invariance would also inform users of the tests such as recruiters who use personality assessments to determine the fit of the applicants and the organization, or even researchers engaged in personality research.

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To date, few studies have looked at the measurement invariance of emotion regulation questionnaires across cultures. The present study aims to address this gap in the literature by investigating the measurement invariance and other psychometric properties of three emotion regulation questionnaires that examines emotion regulation from three different perspectives in a Singaporean sample, one representation of Asian culture, and an Australian sample, one representation of Western culture. The three questionnaires are: (1) Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), (2) Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004), and the (3) Perth Emotion Regulation Competency Inventory (PERCI; Preece et al., 2018a).

Whilst results from any single Asian country (i.e., Singapore), or any single Western country (i.e., Australia), cannot be seen as prototypical to all Asian or Western countries, analysis of emotion regulation patterns in Singapore and Australia can provide some useful data on the cross-cultural applicability of emotion regulation. Crucially, Singapore and Australia adhere to this pattern of Asian and Western differentiation along this key dimension. Singapore is comprised mainly of people of Asian descent (i.e., Chinese [76%], Malays [15%], and Indians [7.5%]; Singapore Government, 2019), and Singaporean culture is regularly described as collectivist (Singelis et al., 1995), as is reflected in key national values such as "nation before community, society and self" and "consensus not conflict" (Tan, 2012). Indeed, Singapore was found to score 20 on the individualism dimension according to Hofstede Insights (n.d.). In contrast, most Australians (80%; Australian Bureau of Statistics, 2017) have roots from Australia, England, Ireland, and Scotland, and scored 90 on the individualism dimension (Compare Countries, n.d.). Australian culture is often described as "egalitarian individualists who care about honesty, truth and transparency" (Brew & Cairns, 2004, p. 332). Furthermore, both Australia and Singapore use English as a national language and are both considered developed countries (Developed Countries List 2022, 2022, 2022). Thus, their use as representations of Western and Asian cultures in this comparison has an advantage of minimizing other sources of variance (i.e., differences due to quality of questionnaire translations, when comparing groups on different language versions of the ERQ, DERS, PERCI).

Emotion regulation questionnaire

The ERQ is a process type emotion regulation questionnaire (i.e., an emotion regulation questionnaire that assesses how individuals regulate their emotions) and was developed based on the process model of emotion regulation (Gross & John, 2003). The process model of emotion regulation stipulates that an emotional response is generated over time and that this trajectory can be modified using emotion regulation strategies (Gross & John, 2003). Specifically, emotions are generated through four stages: (1) situation (e.g., a current unfolding situation), (2) attention (e.g., attention paid to the situation), (3) appraisal (e.g., evaluation of the situation in light of one's goals), (4) response (e.g., generated emotion and its associated physiological and behavioral responses) (Gross, 2015). The ERQ assesses the usage of two of these emotion regulation strategies when people experience positive or negative emotions: (1) cognitive reappraisal; that is, a cognitive change strategy focused on changing the evaluation of the situation to either change or reduce the intensity of the emotion elicited, (e.g., "When I'm faced with a stressful situation, I make myself think about it in a way that helps me stay calm.") and (2) expressive suppression; that is, a response modulation strategy comprised of masking the behavioral expression of an emotion elicited (e.g., "I control my emotions by not expressing them.") (Gross & John, 2003). A two-factor orthogonal model, with factors corresponding to the two strategies, was found in the original paper (Gross & John, 2003) and was supported in over 20 countries such as Australia, US, Canada, China, India, and Japan (Matsumoto et al., 2008; Preece et al., 2020; Preece et al., 2021). Several studies have compared a two-factor correlated model and a two-factor uncorrelated model, finding that the difference between the nested models were not significant (Balzarotti et al., 2010; Gross & John, 2003). Previous studies on the measurement invariance of the ERQ has been conducted primarily amongst Western countries (Melka et al., 2011; Rice et al., 2018; Sala et al., 2012), with no direct comparison across Asian and Western cultures.

Difficulties in emotion regulation scale

The DERS assesses emotion regulation using a competency approach. Competency approaches assess one's use of skills to successfully regulate negative emotions. The DERS assesses six competency deficits: (1) Non-acceptance (e.g., "When I'm upset, I feel guilty for feeling that way."), (2) Goals (e.g., "When I'm upset, I have difficulty getting work done."), (3) Impulse (e.g., "When I'm upset, I have difficulty controlling my behaviors."), (4) Awareness (e.g., "I pay attention to how I feel."), (5) Strategies (e.g., "When I'm upset, I know that I can find a way to eventually feel better."), and (6) Clarity (e.g., "I know exactly how I am feeling."). This six-factor correlated factor structure has not been well-supported across Asian and Western cultures or translated versions of the DERS, where only a handful of studies replicated the intended structure (French; Dan-Glauser & Scherer, 2013; Chinese; Li et al., 2018; Italian; Giromini et al., 2012; Brazilian; Miguel et al., 2017), while others came up with alternative structures (Bardeen et al., 2012; Hindi; Bhatnagar et al., 2020; Korean; Cho & Hong, 2013; Portuguese; Coutinho et al., 2010; Greek; Mitsopoulou et al., 2013; Turkish; Ruganci & Gençöz, 2010; Gujarati; Snow et al., 2013). The results on the measurement invariance of the DERS using the six-factor correlated factor structure have also been mixed. A study that assessed the measurement invariance across samples of Caucasian, Asian Americans, and African Americans found that the DERS had latent means invariance, meaning that the factor structure, factor loadings, item thresholds and factor means were equal across the three groups (Ritschel et al., 2015). However, when

assessed across Indian and American samples, the DERS failed to achieve configural invariance (Snow et al., 2013).

Perth emotion regulation competency inventory

Finally, the PERCI, also a competency type questionnaire, was developed to assess how well individuals regulate their emotions based on their ability to modify the two response channels of emotion (Preece et al., 2018a): (1) subjective-experiential (i.e., controlling their subjective-experiential of emotion) and (2) behavioral (i.e., inhibiting and activating behaviors when one is emotional) (Evers et al., 2014). The PERCI also evaluates an individual's tolerance for emotions because it is a crucial factor that drives individuals to activate a goal to regulate their emotions. The PERCI is able to measure each of these components for both positive and negative emotions. Hence, it contains eight subscales: (1) Negative—Controlling Experience (N-SUB) (e.g., "When I'm feeling bad, I'm powerless to change how I'm feeling."), (2) Negative—Inhibiting Behavior (N-INH) (e.g., "When I'm feeling bad, I do stupid things."), (3) Negative—Activating Behaviors (N-ACT) (e.g., "When I'm feeling bad, those feelings stop me from getting work done."), (4) Negative—Tolerating Emotions (N-TOL) (e.g., "When I'm feeling bad, I can't allow those feelings to be there."), (5) Positive—Controlling Experience (P-SUB) (e.g., "I don't know what to do to create pleasant feelings in myself."), (6) Positive—Inhibiting Behavior (P-INH) (e.g., "When I'm feeling good, my behavior becomes out of control."), (7) Positive—Activating Behaviors (P-ACT) (e.g., "When I'm feeling good, I have trouble completing tasks that I'm meant to be doing."), (8) Positive—Tolerating Emotions (P-TOL) (e.g., "When I'm feeling good, part of me hates those feelings."). Information on the composites scores that can be calculated can be found here (https://www.researchgate.net/publication/326547664_Perth_Emotion_Regulation_Competency_Inventory_PERCI_Copy_of_questionnaire_and_scoring_instructions).

In the original PERCI validation study, a first-order eight-factor model was found and a third-order model where the first-order subscales loaded onto the second-order Negative or Positive emotion regulation factors respectively, and the second-order factors loaded onto a third-order general emotion regulation factor (Preece et al., 2018a). The PERCI demonstrated stable factor structure in an Australian community sample, excellent internal consistency, and concurrent validity with psychopathology, alexithymia, and attachment style (Preece et al., 2018a). As the PERCI is a relatively new measure of emotion regulation, its measurement invariance has yet to be evaluated across cultures.

Present study

Differences in the way different cultures experience and perceive emotion has highlighted the importance of assessing measurement invariance of measures of emotional regulation. The present study investigated the measurement invariance and other psychometric properties (i.e., factor structure, internal consistency, and concurrent validity) of three emotion regulation questionnaires, the ERQ, DERS, and the PERCI across representative Asian and western cultures, specifically Singapore and Australia.

Method

Participants and procedure

Our Singaporean sample consisted of 434 participants (52.5% Female). The mean age was 34.68 (13.03). To ensure that any differences found between the two samples could be attributed to culture, we removed participants that did not come from an Asian cultural background from the Singaporean sample. As such, 100% of the Singaporean sample came from an Asian cultural background. 13.1% of the sample consisted of university students.

Our Australian sample consisted of 489 participants (67.9% Female). The mean age was 34.91 (20.08). Similarly, to ensure that any differences found between the two samples could be attributed to culture, we removed participants that came from an Asian cultural background from the Australian sample. As such, 90.18% of the Australian sample identified as Caucasian, 4.91% did not specify their cultural background, 2.04% identified as Middle Eastern, 1.23% identified as Aboriginal and Torres Strait Islander, while 1.23% identified as African. 56.9% of the sample consisted of university students. See Table S1 for the demographics of each sample.

Participants signed up on one of these three online platforms: (1) Qualtrics; an online survey recruitment company, (2) SONA; an online university research participant portal, and (3) an advertisement posted on a social media website. After signing up on the respective platforms, participants completed the ERQ, DERS, and PERCI, along with the various questionnaires that were used as concurrent validity markers as part of a test battery that was administered online. The present study is part of a broader project looking at the cross-cultural measurement of emotional constructs. The project uses a shared data set that has produced previous publications (Chan et al., 2023). The shared data set has not been used to study the cross-cultural measurement of emotion regulation anywhere, except in the present study.

All participants provided informed consent. Participants recruited from Qualtrics received monetary compensation for their time, while participants recruited from SONA received the same marks that contributed to their overall grade. Ethical approval to conduct this study was granted by University of Western Australia Human Research Ethics Committee (RA/4/20/5393).

Materials

Harmony and unique subscale of the Auckland individualism and collectivism scale (AICS)

To test the cultural orientation of our samples, we used the Harmony subscale (a marker of collectivism; desire to avoid conflicts and act in accordance with social norms) and

Unique subscale (a marker of individualism; how much one perceives themselves to be uniquely different from others) of the AICS (Shulruf et al., 2007). Both subscales have four items, answered on a six-point Likert scale, with higher scores indicating greater support for the attribute.

ERQ

The ERQ is a 10-item self-report measure that assesses the use of two commonly used emotion regulation strategies—cognitive reappraisal and suppression (Gross & John, 2003). Six items measure the use of cognitive reappraisal and four items measure the use of expressive suppression. It is responded to on a seven-point scale, where '1 = Strongly Disagree' and '7 = Strongly Agree'. Higher scores indicate greater use of the emotion regulation strategy. Both subscales have adequate to good internal consistency reliabilities (α = .68 – .82) (Gross & John, 2003).

DERS

The DERS is a 36-item self-report measure of the difficulties in regulating negative emotions (Gratz & Roemer, 2004). It has six subscales: Non-acceptance, Goals, Impulse, Awareness, Strategy, and Clarity. It has 11 reverse-scored items and is responded to on a 5-point Likert scale, where '1 = Almost Never' to '5 = Almost Always'. Higher scores indicate greater difficulty with that aspect of emotion regulation. All subscales have adequate internal consistency reliabilities (α = .84 – .89) (Gratz & Roemer, 2004).

PERCI

The PERCI is a 32-item self-report measure of how successful an individual perceives to be in regulating their emotions (Preece et al., 2018a). It has eight subscales: N-SUB, N-INH, N-ACT, N-TOL, P-SUB, P-INH, P-ACT, P-TOL. It is responded to on a seven-point Likert scale, where '1 = Strongly Disagree' and '7 = Strongly Agree', where higher scores indicate greater difficulty in regulating emotions. All subscales have excellent internal consistency (α = .84 – .94) (Preece et al., 2018a).

Depression, anxiety, stress scale – 21

The Depression Anxiety Stress Scale-21 (DASS-21) is a 21-item self-report that measures the levels of depression, anxiety and stress of a person in the past week and is responded to on a four-point Likert scale (DASS-21; Lovibond & Lovibond, 1995). Higher scores indicate higher levels of depression, anxiety and stress. All subscales have demonstrated excellent internal consistency (α = .81 – .91) (Lovibond & Lovibond, 1995).

Perth alexithymia questionnaire

The PAQ is a 24-item self-report measure of alexithymia (PAQ; Preece et al., 2018b). It measures alexithymia based on its three components and is able to assess two components by emotional valence. It has five subscales: (1) Negative-Difficulty Identifying Feelings (N-DIF) (2) Positive-Difficulty Identifying Feelings (P-DIF), (3) Negative-Difficulty Describing Feelings (N-DDF), (4) Positive-Difficulty Describing Feelings (P-DDF), and (5) General-Externally Orientated Thinking (G-EOT). It is responded to on a 7-point Likert scale, where '1 = Strongly Disagree' and '7 = Strongly Agree'. Higher scores indicate higher levels of alexithymia. All subscales demonstrated excellent internal consistency reliabilities (α = .88 – .91) (Preece et al., 2018b).

Data analysis plan

Factor structure

The factor structure of the ERQ, DERS, and PERCI was examined in each sample, Singapore and Australia, using a series of CFAs. The model that was found to best fit both samples was used to test for measurement invariance. Maximum likelihood estimation with robust standard errors and the Satorra and Bentler's (1994) scaled test statistic were used. All CFAs were conducted using the lavaan package (Rosseel, 2012) in RStudio version 1.2.5033 (R Core Team, 2020). Factor loadings ≥ .40 were considered meaningful loadings (Stevens, 2012). The minimum criteria to achieve good model fit were: (1) Comparative Fit Index > .90, (2) Tucker Lewis Index > .90, (3) Root Mean Square Error of Approximation < .08, (4) Standardized Root Mean Square Error < .08 (Gana & Broc, 2019). The Akaike Information Criterion was also examined, where model complexity is penalized, and smaller values indicate better model fit (Gana & Broc, 2019).

Models tested for the ERQ. We tested two models for the ERQ. First, we tested a one-factor model to evaluate whether the ERQ is multi-dimensional. Second, we tested a two-factor uncorrelated model, consisting of cognitive reappraisal and suppression. This model is the original factor structure of the ERQ. Figures depicting the factor models can be found in the supplementary materials.

Models tested for the DERS. We tested five different models for the DERS. First, we tested a one-factor model to see if the DERS is multi-dimensional. Secondly, we tested a six-factor model of the DERS. The six factors were: Non-acceptance, Goals, Impulse, Awareness, Strategy, Clarity. This six-factor model is the original factor structure of the DERS. Third, we tested the tested a five-factor model where the Awareness subscale was removed. This was previously examined in an American and Indian sample (Bardeen et al., 2012; Bhatnagar et al., 2020; Snow et al., 2013). Fourth, we tested an alternative five-factor model solution that was found in a Korean sample where Awareness and Clarity were combined into an Understanding subscale (Cho & Hong, 2013). Finally, we tested the six-factor model with a method factor to account for any variance due to reverse scored items. Reverse scored items were specified to load onto the method factor on top of its originally specified factor (e.g., Awareness).

Models tested for the PERCI. We tested three models for the PERCI. First, we tested a two-factor model, where the

PERCI items were split by emotional valence. The two factors were: Negative Emotion Regulation and Positive Emotion Regulation. Next, we tested a four-factor model, where the PERCI was split into the four components of emotion regulation as delineated by Preece et al. (2018a). These represented the subjective-experiential and behavioral emotion response channels, regardless of valence of emotion. The four factors were: General-Controlling Emotions, General-Inhibiting Behaviors, General-Activating Behaviors, General-Tolerating Emotions. Finally, we tested the first-order eight-factor model, where the PERCI was split into its measurable component of emotion regulation by valence of emotion. The eight factors were: N-SUB, N-INH, N-ACT, N-TOL, P-SUB, P-INH, P-ACT, P-TOL.

Measurement invariance

Measurement invariance of the ERQ, DERS, and the PERCI were examined with the factor model that fit the best for both the Singaporean and Australian samples using the lavaan package (Rosseel, 2012) in RStudio version 1.2.5033 (R Core Team, 2020). Measurement invariance was conducted in a series of hierarchical models where each model became increasingly specified by constraining more model parameter estimates to be equal across groups. Each model was compared with its predecessor to see if there was a significant decrease in model fit. A decrease greater than .01 on the CFI fit index (Cheung & Rensvold, 2002) and a chi-square difference test was used to determine if the questionnaire was not invariant across both samples. In the first model, the configural model, the overall factor structure (i.e., number of factors) was constrained across groups. In the second model, the metric model, the factor loadings of the items were constrained to be equal across groups, on top of restrictions to the factor structure. In the third model, the scalar model, item intercepts were constrained to be equal across groups, on top of the restrictions that were already applied. This is the minimum level of measurement invariance needed to be achieved so that one can compare factor means across groups and make meaningful inferences about their differences (Chen, 2008). In the final model, the residual model, item variances are constrained to be equal across groups, on top of the restrictions that were already applied. At this level of measurement invariance, raw scores can be used to compare across groups (Vandenberg & Lance, 2000).

Internal consistency

Internal consistency coefficients for the composite and subscale scores of the ERQ, DERS, and PERCI were calculated using Macdonald's omega (ω) and Cronbach's alpha (α) using JASP 0.12.2 (JASP Team, 2020). Reliability coefficients ≥ .70 are acceptable, ≥ .80 are good, ≥ .90 are excellent (Nunnally, 1994).

Descriptive statistics and group comparisons

Latent factor scores of the total and subscale scores of the respective questionnaires were calculated based on the results of MI using the lavaan package in R to find the true scores of each sample. These scores were used to conduct one-way ANCOVAs with age, gender, and education as covariates, and country (Singapore, Australia) as the independent variable using SPSS Version 27 to test if there are any significant differences on the ERQ, DERS, PERCI between Singaporeans and Australians. A chi-square test revealed a significant relationship between gender and education χ^2 (8, 923) = 76.54, $p < .001$, violating the assumption that covariates should be independent. Indeed, both countries reported greater increases in females attaining tertiary qualifications as compared to males (Coelli, 2022; Singapore Department of Statistics, 2022). Hence, age and gender were used as covariates.

Concurrent validity

Concurrent validity was assessed using Pearson's correlations between the subscales and composite scores of the ERQ, DERS, PERCI, DASS-21, and PAQ. Pearson's correlations were calculated using JASP 0.12.2 (JASP Team, 2020). The following hypotheses applied for both samples.

We hypothesized that all the subscales of the DASS-21 will be negatively correlated with cognitive appraisal, but positively correlated with suppression, the DERS, and the PERCI because greater psychopathology is associated with greater usage of maladaptive emotion regulation strategies (i.e., suppression) (Aldao et al., 2010) and greater difficulties in regulating emotions (Preece et al., 2018a). We also hypothesized that all the subscales of the PAQ will be negatively correlated with cognitive appraisal, but positively correlated with suppression, the DERS, and the PERCI because higher levels of alexithymia are associated with greater usage of maladaptive emotion regulation strategies (i.e., suppression) (Preece et al., 2018b) and greater difficulties in regulating emotions (Luminet & Zamariola, 2018; Preece et al., 2017).

Results

Preliminary analyses

Bootstrapped one-way ANCOVAs (with age and gender as covariates) comparing the Singapore and Australian groups on the AICS supported that our samples did indeed differ on these cultural dimensions. Singaporeans reported more collectivism than Australians ($M_{Singapore}$ = 15.24, $M_{Australia}$ = 14.21, F[1,919] = 12.25, $p < .001$, η^2 = .013, Cohen's d = 0.31), and Australians reported more individualism than Singaporeans ($M_{Singapore}$ = 15.29, $M_{Australia}$ = 17.03, F(1,919) = 31, $p < .001$, η^2 = .033, Cohen's d = 0.37). Thus, our findings converge with Hofstede's (1980) previous work and justifies using these two groups as one type of Asian sample, and one type of Western sample, in the current study.

Factor Structure

The two-factor uncorrelated model of the ERQ was the best fitting model for both samples. It demonstrated excellent model fit across both samples (CFI = .934 – .943, RMSEA = .071 – .087) (See Table 1). Using the two-factor uncorrelated model, all items loaded significantly onto its

respective factors for both samples, except for item 4 in the Singaporean sample (See Table 2).

For the DERS, the one-factor model had poor model fit across both samples (CFI = .597 – .604, RMSEA = .124 – .133) (See Table 1), indicating that the DERS was multidimensional. The original six-factor model and the five-factor model (Awareness and Clarity combined) both did not have satisfactory model fit across both samples (CFI = .788 – .890, RMSEA = .071 – .090), which left us with the five-factor model (Awareness removed) and the six-factor plus method model. For both samples, the six-factor plus method factor model had better incremental fit indices (i.e., CFI, TLI) and absolute fit indices (i.e., RMSEA, SRMR), while the five-factor model (Awareness removed) had better parsimonious fit index (i.e., AIC). Between the two models, the six-factor plus method factor model was chosen as the best fitting model so that it remained within the conceptualization of DERS and accounted for the method effects due to the reverse-scored items (CFI = .891 – .917, RMSEA = .062 – .066). Using the six-factor plus method factor model, a few items failed to meet the minimum factor loading requirement of .40 onto their respective factor across both samples (See Table 2) (Singapore: items 10, 17, 34; Australia: items 17, 34). Furthermore, a few items loaded more significantly onto the method factor than their respective regulation factor (Singapore: items 6, 10, 17, 8, 34; Australia: items 10, 17, 34). All the factors were significantly correlated with each other across both samples (*r*s = .21 – .79), although the Awareness factor had weaker correlations with all the other factors, except for Clarity (See Table S2).

For the PERCI, the one-factor model had poor model fit across both samples, indicating that the PERCI was multi-dimensional (CFI = .497 – .534, RMSEA = .143 – .151) (See Table 1). The two-factor model and the four-factor model also had poor model fit across both samples, demonstrating the necessity to break the PERCI down by emotional valence and component of emotion regulation (CFI = .625 – .726, RMSEA = .109 – .131). The eight-factor model demonstrated excellent model fit across both samples and was the best fitting model for both samples (CFI = .936 – .944, RMSEA = .052 – .054). Using the eight-factor model, all items loaded significantly onto their respective factors for both samples (See Table 2). All the factors were significantly correlated with each other across both samples (*r*s = .15 – .83) (See Table S3).

Table 1. Model fit indices from the confirmatory factor analyses conducted on the various models of the ERQ, DERS, and the PERCI for the Singaporean ($n = 434$) and Australian sample ($n = 489$).

Model	SB_χ^2	df	CFI	TLI	RMSEA (90% Confidence Intervals)	SRMR	AIC
Emotion Regulation Questionnaire							
One-factor model							
Singapore	266.417	35	.713	.631	.158 (.141 – .176)	.128	14565.123
Australia	500.504	35	.676	.584	.193 (.178 – .208)	.158	16357.183
Two-factor uncorrelated model							
Singapore	80.89	35	.943	.926	.071 (.05 – .091)	.083	14261.870
Australia	120.83	35	.934	.915	.087 (.07 – .104)	.072	15855.930
Difficulties in Emotion Regulation Scale							
One-factor model							
Singapore	3758.779	594	.597	.573	.124 (.120 – .127)	.120	41423.716
Australia	4538.857	594	.604	.580	.133 (.13 – .137)	.123	47480.489
Six-factor model							
Singapore	1854.812	579	.841	.828	.079 (.075 – .083)	.094	39026.187
Australia	1722.143	579	.890	.880	.071 (.067 – .075)	.073	43740.663
Five-Factor model (Removed Awareness)							
Singapore	1205.435	395	.88	.868	.077 (.072 – .082)	.068	32090.645
Australia	1213.689	395	.906	.897	.074 (.070 – .079)	.062	35975.769
Five-factor model (Awareness and Clarity Combined)							
Singapore	2277.181	584	.788	.771	.090 (.087 – .094)	.140	39550.689
Australia	2380.35	584	.826	.812	.089 (.085 – .093)	.124	44571.106
Six-factor plus method factor model							
Singapore	1443.632	568	.891	.879	.066 (.062 – .070)	.083	38552.521
Australia	1413.932	568	.917	.908	.062 (.058 – .066)	.065	43401.358
Perth Emotion Regulation Competency Inventory							
One-factor model							
Singapore	3459.024	464	.534	.502	.143 (.138 – .147)	.139	47327.537
Australia	4481.572	464	.497	.462	.151 (.147 – .155)	.133	52686.362
Two-factor model							
Singapore	2187.215	463	.726	.707	.109 (.105 – .114)	.101	45654.322
Australia	3468.844	463	.625	.598	.131 (.127 – .135)	.123	51361.580
Four-factor model							
Singapore	2853.144	458	.638	.608	.126 (.122 – .131)	.169	46399.001
Australia	2865.731	458	.698	.673	.118 (.114 – .122)	.132	50614.666
Eight-factor model							
Singapore	838.088	436	.936	.927	.054 (.049 – .060)	.051	43827.611
Australia	900.153	436	.944	.936	.052 (.047 – .057)	.047	48078.191

Note. SB_χ^2 = Satorra-Bentler Chi Square, df = Degrees of Freedom, CFI = Comparative Fit Index, TLI = Tucker-Lewis Index, RMSEA = Root Mean Square Error of Approximation, SRMR = Standardized Root Mean Square Residual, AIC = Akaike Information Criteria.

Table 2. Standardized factor loadings of the emotion regulation questionnaire (ERQ) (two-factor uncorrelated model), difficulties in emotion regulation Scale (DERS) (six-factor model + method) and the Perth emotion regulation Competency Inventory (PERCI) (eight-factor model) based on the best fitting model.

ERQ			DERS			PERCI		
	Standardized Factor Loading			Standardized Factor Loading			Standardized Factor Loading	
Subscale/Item no.	Singapore	Australia	Subscale/Item no.	Singapore	Australia	Subscale/Item no.	Singapore	Australia
Cognitive reappraisal			*Non-acceptance*			*N-SUB*		
Item 1	.50***	.62***	Item 25	.75***	.86***	Item 1	.69***	.80***
Item 3	.63***	.64***	Item 21	.80***	.87***	Item 5	.81***	.81***
Item5	.52***	.62***	Item 12	.79***	.85***	Item 9	.78***	.78***
Item 7	.82***	.79***	Item 11	.76***	.75***	Item 13	.78***	.78***
Item 8	.76***	.85***	Item 29	.80***	.82***	*N-INH*		
Item 10	.81***	.83***	Item 23	.70***	.74***	Item 3	.74***	.82***
Suppression			*Goals*			Item 7	.86***	.86***
Item 2	.72***	.77***	Item 26	.85***	.85***	Item 11	.87***	.88***
Item 4	.38***	.52***	Item 18	.88***	.92***	Item 15	.70***	.66***
Item 6	.80***	.81***	Item 13	.83***	.88***	*N-ACT*		
Item 9	.58***	.62***	Item 33	.82***	.80***	Item 2	.87***	.88***
			Item 20	.56*** (.28***)	.69*** (.31***)	Item 6	.90***	.89***
			Impulse			Item 10	.89***	.91***
			Item 32	.83***	.87***	Item 14	.88***	.91***
			Item 27	.82***	.86***	*N-TOL*		
			Item 14	.83***	.84***	Item 4	.71***	.76***
			Item 19	.87***	.87***	Item 8	.83***	.75***
			Item 3	.58***	.68***	Item 12	.76***	.85***
			Item 24	.46*** (.41***)	.55*** (.36***)	Item 16	.71***	.64***
			Awareness			*P-SUB*		
			Item 6	.49*** (.64***)	.67*** (.46***)	Item 18	.61***	.62***
			Item 2	.63*** (.57***)	.72*** (.43***)	Item 22	.75***	.78***
			Item 10	.12* (.58***)	.42*** (.56***)	Item 26	.68***	.67***
			Item 17	.01 (.48***)	.26*** (.50***)	Item 30	.80***	.79***
			Item 8	.46*** (.65***)	.60*** (.44***)	*P-INH*		
			Item 34	−0.12 (.47***)	.34*** (.48***)	Item 17	.66***	.61***
			Strategy			Item 21	.76***	.80***
			Item 16	.78***	.83***	Item 25	.67***	.69***
			Item 15	.77***	.85***	Item 29	.74***	.82***
			Item 31	.68***	.77***	*P-ACT*		
			Item 35	.80***	.82***	Item 19	.75***	.74***
			Item 28	.67***	.78***	Item 23	.84***	.83***
			Item 22	.40*** (.46***)	.50*** (.54***)	Item 27	.82***	.86***
			Item 36	.77***	.81***	Item 31	.85***	.86***
			Item 30	.76***	.79***	*P-TOL*		
						Item 20	.69***	.74***
						Item 24	.76***	.81***
						Item 28	.80***	.87***
						Item 32	.83***	.87***

Note. ***$p < .001$. N-SUB = Negative-Controlling Experience, N-INH = Negative-Inhibiting Behavior, N-ACT = Negative-Activating Behavior, N-TOL = Negative-Tolerating Emotions, P-SUB = Positive-Controlling Experience, P-INH = Positive-Inhibiting Behavior, P-ACT = Positive-Activating Behavior, P-TOL = Positive-Tolerating Emotions. Factor loadings in brackets refer to the factor loadings onto the method factor.

Measurement invariance

Next, we examined the measurement invariance of the three questionnaires across Singaporean and Australian samples. For the ERQ, we examined measurement invariance using the two-factor uncorrelated model. For the DERS, we used the six-factor plus method factor model. For the PERCI, we used the eight-factor model. When using the CFI criteria, all three questionnaires reached residual invariance (see Table 3). The addition of constraints on the factor loadings (i.e., metric variance), item intercepts (i.e., scalar variance) and item variances (i.e., residual variance) did not significantly worsen the model fit ($\Delta CFI < 0.1$), meaning that the factor structure, factor loadings, item intercepts and item variances were equal across both samples. This implied that for all the questionnaires, Singaporeans and Australians interpreted the items similarly, assigned similar weighting to each item of the questionnaire, had similar starting points and utilized the response scales to similar degrees.

When using the chi-square difference test as a criteria for invariance, both the ERQ and the PERCI achieved metric invariance as there was a significant difference in the Satorra-Bentler scaled chi-square between the scalar model and the metric model ($p < .05$). Whereas, the DERS achieved configural invariance as there was a significant difference between the Satorra-Bentler scaled chi-square between the configural model and the metric model.

Internal consistency

The internal consistency reliabilities were acceptable for all the composite and subscale scores of the ERQ, DERS, PERCI across both samples (See Table 4). The cognitive reappraisal

Table 3. Model fit indices from the measurement invariance conducted on the emotion regulation questionnaire (ERQ) (two-factor uncorrelated model), difficulties in emotion regulation Scale (DERS) (six-factor model + method), Perth emotion regulation Competency Inventory (PERCI) (eight-factor model) across Singaporean samples ($n = 434$) and Australian ($n = 489$).

Type of Invariance	SB_χ^2	df	CFI	TLI	RMSEA (90% Confidence Interval)	SRMR	AIC	SB_χ^2 difference test statistic
ERQ								
Configural	189.618	68	.941	.922	.078 (.065 – .092)	.056	30147.683	
Metric	200.561	76	.941	.930	.074 (.062 – .087)	.059	30143.688	8.986
Scalar	220.236	84	.938	.933	.073 (.061 – .085)	.061	30145.991	18.890*
Residual	224.917	94	.937	.939	.069 (.058 – .081)	.063	30151.105	11.091
DERS								
Configural	2856.940	1136	.906	.896	.064 (.061 – .067)	.072	82097.879	
Metric	2958.723	1176	.903	.896	.064 (.061 – .067)	.081	82134.546	101.870***
Scalar	3058.913	1205	.900	.895	.064 (.061 – .067)	.081	82162.666	120.613***
Residual	3072.460	1241	.900	.898	.063 (.060 – .066)	.081	82153.719	35.917
PERCI								
Configural	1734.968	872	.940	.932	.053 (.05 – .057)	.048	92033.802	
Metric	1771.435	896	.940	.933	.053 (.049 – .056)	.049	92024.751	34.664
Scalar	1833.440	920	.938	.933	.053 (.049 – .057)	.050	92033.768	71.730***
Residual	1897.271	952	.932	.929	.054 (.051 – .058)	.051	92174.626	63.797***

Note. ***$p < .001$. **$p < .01$. *$p < .05$. SBX2 = Satorra-Bentler Chi Square, df = Degrees of Freedom, CFI = Comparative Fit Index, TLI = Tucker-Lewis Index, RMSEA = Root Mean Square Error of Approximation, SRMR = Standardized Root Mean Square Residual, AIC = Akaike Information Criteria. Chi square difference test was conducted in accordance with Mplus (n.d).

subscale of the ERQ had adequate internal consistency reliabilities of ω = .84 – .87, α = .83 – .87 across both samples. The suppression subscale of the ERQ had noticeably lower internal consistency reliabilities than the cognitive reappraisal subscale but still adequate across both samples, ω = .72 – .78, α = .70 – .77. The internal consistency reliabilities of all the DERS and PERCI composite and subscale scores were also adequate across both samples, ω = .80 – .94, α = .80 – .94.

Descriptive statistics and group comparisons

The distribution of the subscale and composite scores were fairly normal as skew was < |2.0| and kurtosis was < |9.0| (See Table S4). Bootstrapped one-way ANCOVAs using the latent factor scores were conducted with age and gender as covariates to test if there were any significant differences on ERQ, DERS, and PERCI between Singaporeans and Australians (See Table 5).

Our results showed that there was a significant difference on the use of cognitive reappraisal and suppression, as measured by the respective subscales of the ERQ. Singaporeans self-reported using both emotion regulation strategies more than Australians.

There were also significant differences on the subscales of the DERS between Singaporeans and Australians, except for the Clarity subscale. Overall, Singaporeans reported greater difficulties controlling their impulses and lower awareness of their emotions while Australians reported greater difficulties accepting their emotions, engaging in goal-directed behaviors, and accessing emotion regulation strategies when they are emotional.

There was no significant difference on the PERCI total score. However, component-level analyses showed that Singaporeans reported greater difficulty in inhibiting behaviors and tolerating emotions, regardless of emotional valence. On the other hand, Australians reported greater difficulties activating behaviors when they were feeling a negatively valenced emotion.

Concurrent validity

Next, we examined the concurrent validity of the three questionnaires (See Tables S5 and S6). The patterns of associations of the ERQ, DERS, and the PERCI were as hypothesized across samples except where stated. The use of cognitive reappraisal was negatively, but generally weakly correlated with negative affect (i.e., DASS-21; $rs = -0.30$ – .05) and alexithymia (i.e., PAQ; $rs = -0.28$ – .04) across both samples. Suppression was positively correlated with DASS-21 (rs = .05 – .28) and alexithymia (rs = .29 – .58) across both samples.

In addition, all the subscales of the DERS and PERCI, except for the Awareness subscale of the DERS were significantly positively correlated with negative affect (i.e., DASS-21; rs = .12 – .70) and alexithymia (rs = .10 – .70) across both samples. These associations were as hypothesized.

However, we noted a couple of exceptions. The Awareness subscale of the DERS had noticeably smaller non-significant correlations with the DASS-21 (rs = .01 – .12) than the remaining subscales of the DERS across samples. The Goals subscale of the DERS and the N-ACT subscale of the PERCI were also not significantly correlated with G-EOT subscale of the PAQ ($rs = -0.04$ – .04) for the Australian sample.

Discussion

Researchers have become increasingly aware of the importance of demonstrating that a questionnaire is invariant, i.e., ensuring that the questionnaire measures the same construct across different groups (Chen, 2008). However, few studies have looked at such measurement invariance in emotion regulation questionnaires across cultures. Therefore, the present study sought to address this by investigating the

psychometric properties of the ERQ, DERS, and the PERCI across Singaporean and Australian samples.

Measurement invariance

Overall, when using the CFI criteria for invariance, all three questionnaires displayed residual invariance, indicating that Singaporeans and Australians broke emotion regulation down into similar components (i.e., configural invariance), used the same items to measure the components (i.e., metric invariance), had similar baseline levels of the items (i.e., scalar invariance), and utilized the scale to similar degrees (i.e., residual invariance) across the three questionnaires. On the other hand, when using the chi-square difference test as a criteria for invariance, the results differed. The ERQ and PERCI displayed metric invariance, while the DERS displayed scalar invariance. Chi-square difference tests has been the most common criteria used to determine variance across the levels for nested models (Gana & Broc, 2019). However, it has been criticized to be sensitive to unequal sample sizes and violations of non-normality (Chen, 2007). In response, other criteria have been introduced such as a decrease in > .01 in CFI (Gana & Broc, 2019), which is now widely accepted and used in the literature.

Confirmatory factor analyses showed that the original two-factor orthogonal model was the best fitting model for the ERQ for both samples, as it has in previous studies across over 20 countries (Matsumoto et al., 2008), indicating that the factor structure of the ERQ is quite stable. On the other hand, the alternative factor solutions (e.g., the five-factor model [Awareness removed]) of the DERS found by previous research, failed to achieve satisfactory model fit. In the present study, adding a method factor to the original six-factor model resulted in adequate model fit across both samples. Finding that a method factor improves model fit is significant because it suggests that a significant portion of variance was due to the wording of the items and needed to be accounted for. To support this, a number of the factor loadings of the Awareness subscale items loaded more strongly on the method factor than the Awareness subscale (Singapore: 6, 8, 10, 17, 34; Australia: 10, 17, 34). Finally, the first-order eight-factor model fit the PERCI well for both samples, suggesting that the PERCI is able to measure how successful an individual is at regulating their emotions by assessing the changes in the subjective-experiential and behavioral channels of emotion, on top of activating a goal to regulate emotions by valence of emotion.

The results of our measurement invariance analyses also support that, while the ERQ, DERS and PERCI may have somewhat differing approaches to conceptualizing and measuring emotion regulation, all were found to be applicable in Singaporeans and Australians. The ERQ assesses the use of cognitive reappraisal and suppression which has been well-documented in past research in both Asian and Western samples (Butler et al., 2007; Eng, 2012; Gross & John, 2003; Soto et al., 2011). There is also some literature demonstrating that the skills the DERS measures are relevant across cultures. For example, past research has investigated the different strategies that Asians and Westerners use to regulate their emotions such as cognitive reappraisal, suppression (Eng, 2012), and rumination (Chang et al., 2010; Maxwell et al., 2005), demonstrating that both Asians and Westerners have access to a range of emotion regulation strategies that they can use. Furthermore, alexithymia, a construct that refers to the amount of attention an individual pays to their emotions and how aware an individual is of their emotions, has been shown to be associated with poorer emotion regulation in both Asian and Western samples (Chan et al., 2023). Therefore, the skills that the DERS measures appear to be applicable across cultures.

The PERCI measures our ability to manipulate the subjective-experiential and behavioral response channels of emotion, as well as the ability to activate a goal to regulate our emotions. To our knowledge, our study is the first to assess emotional regulation within this framework in an Asian sample, and results affirms the idea that Asians regulate their emotions experientially (i.e., the subjective feeling of an emotion) and behaviorally (i.e., a visible behavioral response to the emotion).

Profile of emotion regulation across Singaporeans and Australians

Having assessed and been assured of the measurement invariance of the ERQ, DERS, and the PERCI across our Singaporean and Australian samples, we assessed if there were any differences on the composite and subscale scores of the ERQ, DERS, PERCI to find out if there were any differences between Singaporeans and Australians in their ability to regulate their emotions. Using the ERQ, Singaporeans reported using suppression and cognitive reappraisal more often than Australians. Using the PERCI, Singaporeans also reported being more intolerant of their emotions, both negative and positive, as demonstrated by the N-TOL and P-TOL subscale of the PERCI. Singaporeans also reported greater difficulty inhibiting their behaviors than Australians, regardless of emotional valence, where there was a significant difference on the N-INH and P-INH subscales of the PERCI. This corroborated with the results of the DERS where Singaporeans reported greater difficulty controlling impulses than Australians as measured by the Impulse subscale of the DERS. On the other hand, Australians reported having lower motivation or greater difficulty activating behaviors, especially when they are feeling a negatively-valenced emotion reflected by a significant difference between Australians and Singaporeans on the Goals subscale of the DERS and the N-ACT subscale of the PERCI. Furthermore, their difficulty in activating behaviors may result in a difficulty in accessing strategies to regulate their emotions, reflected by a significant difference between Australians and Singaporeans on the Strategies subscale of the DERS.

Emotion regulation also demonstrated similar patterns of relationships with the relevant constructs across Singaporean and Australian samples where the ERQ, DERS, PERCI all demonstrated the hypothesized correlations with

Table 4. Internal consistency reliabilities of the composite and subscale scores of the emotion regulation questionnaire (ERQ), difficulties in emotion regulation Scale (DERS), and Perth emotion regulation Competency Inventory (PERCI), as measured by macdonald's omega and Cronbach's alpha.

	Singapore ($n = 434$)			Australia ($n = 489$)		
Questionnaire/ Subscale	Average inter-item correlation	ω	α	Average inter-item correlation	ω	α
ERQ						
Cognitive Reappraisal	.45	.84	.83	.52	.87	.87
Suppression	.37	.72	.70	.46	.78	.77
DERS						
Composite Scores						
Total	.28	.94	.94	.34	.95	.95
Subscales						
Non-acceptance	.59	.90	.89	.66	.92	.92
Goals	.61	.89	.89	.68	.92	.91
Impulse	.30	.82	.72	.31	.85	.72
Awareness	.38	.80	.79	.48	.85	.85
Strategies	.48	.89	.88	.58	.92	.92
Clarity	.50	.84	.84	.56	.87	.87
PERCI						
Composite Scores						
Total	.32	.94	.94	.31	.94	.94
Subscales						
Negative-Controlling Experience	.59	.85	.85	.63	.87	.87
Negative-Inhibiting Behavior	.63	.87	.87	.64	.88	.88
Negative-Activating Behavior	.79	.94	.94	.80	.94	.94
Negative-Tolerating Emotions	.57	.84	.84	.56	.84	.84
Positive-Controlling Experience	.50	.80	.80	.51	.81	.81
Positive-Inhibiting Behavior	.50	.80	.80	.54	.83	.83
Positive-Activating Behavior	.66	.89	.89	.68	.89	.89
Positive-Tolerating Emotions	.58	.85	.85	.67	.89	.89

Table 5. Results of the one-way ANCOVAs conducted to test for differences on emotion regulation questionnaire (ERQ), difficulties in emotion regulation Scale (DERS), and Perth emotion regulation Competency Inventory (PERCI) between Singaporeans and Australians.

	Singapore ($n = 434$)	Australia ($n = 489$)					
Total/subscale	M (SD)	M (SD)	F	df	*p*	n^2	Cohen's d
ERQ							
Cognitive Reappraisal	30.69 (5.17)	28.89 (5.40)	25.69	919	<.001	.03	0.34
Suppression	16.71 (3.60)	15.20 (4.22)	34.86	919	<.001	.04	0.38
DERS							
Composite Scores							
Total	85.01 (21.37)	85.98 (24.32)	.42	919	.52	.00	.04
Subscales							
Non-acceptance	13.69 (5.25)	14.39 (5.75)	3.67	919	.06	.00	0.12
Goals	13.65 (4.62)	14.61 (4.93)	10.09	919	< .01	.01	0.20
Impulse	12.87 (4.50)	11.96 (4.80)	8.76	919	< .01	.01	0.20
Awareness	16.06 (4.10)	15.66 (4.22)	2.18	919	.14	.00	0.10
Strategy	17.95 (6.25)	18.57 (7.23)	1.91	919	.17	.00	0.09
Clarity	10.79 (3.23)	10.80 (3.54)	0.00	919	.98	.00	0.00
PERCI							
Composite Scores							
Total	96.18 (2.81)	92.96 (3.00)	3.03	919	.082	.00	1.11
Subscale Scores							
Negative-Controlling Experience	13.43 (4.79)	13.43 (5.02)	0.00	919	.99	.00	0.00
Negative-Inhibiting Behavior	12.30 (5.44)	11.20 (5.35)	10.14	919	< .01	.01	0.20
Negative-Activating Behavior	15.36 (6.15)	16.63 (6.55)	9.50	919	< .01	.01	0.20
Negative-Tolerating Emotions	16.38 (5.00)	15.08 (4.58)	17.24	919	<.001	.02	0.27
Positive-Controlling Experience	12.46 (4.17)	12.51 (4.44)	0.03	919	.87	.00	0.01
Positive-Inhibiting Behavior	9.29 (3.73)	8.49 (3.63)	10.49	919	< .01	.01	0.22
Positive-Activating Behavior	9.29 (4.27)	9.15 (4.07)	0.25	919	.62	.00	0.03
Positive-Tolerating Emotions	7.69 (3.62)	6.48 (3.03)	28.10	919	<.001	.03	0.36

psychopathology and alexithymia across both samples, generally corroborating with what previous research has found. Greater difficulties in emotion regulation were associated with greater levels of depression, anxiety, stress, and alexithymia. Use of adaptive emotion regulation strategies such as cognitive reappraisal was also associated with lowered depression, anxiety, stress, and alexithymia, while the opposite was found for suppression. We also noted that suppression was more strongly correlated with psychopathology in our Singaporean sample than the Australian sample suggesting that the use of suppression was associated with more psychological distress in Singaporean samples. The Awareness subscale of the DERS had noticeably smaller correlations with psychopathology but strong positive correlations with alexithymia, corroborating with previous research.

Limitations and future directions

Our study was not without limitations. Firstly, our recruitment methods for our samples differed, resulting in a large proportion of the Australian sample being made of university students, while the Singaporean sample was a largely community sample. We tried to make adjustments for this by taking age into consideration when conducting ANCOVAs, but this was only one of the analyses that we conducted. Secondly, we acknowledge that our Asian and Western samples are quite narrow as Singapore and Australia may not be representative of all Asian and Western countries. Furthermore, Singapore is a relatively well-developed country. While its traditional values are primarily influenced by Confucius (Tan, 2012), with increase in media exposure to Western culture, its traditional values are slowly being watered down and westernized. Hence, future research may wish to examine the psychometric properties of these questionnaires in diverse samples (e.g., other Asian and Western countries, clinical samples) to extend the generalizability of our results. Next, we acknowledge that where multiple significance tests have been conducted, but no correction has been made. Finally, the present study was focused on using self-report measures to assess an individual's ability to regulate their emotions, which may be dependent on the

individual's ability to reflect on their ability to regulate emotions. Future research may wish to examine the use of the ERQ, DERS, and the PERCI alongside other methods of assessing emotion regulation to understand how self-report measures corroborate with an individual's actual ability to regulate their emotions.

General conclusion

Overall, the ERQ, DERS, and PERCI demonstrated residual invariance across Singaporean and Australian samples. This meant that the raw scores of each questionnaire (e.g., composite or subscale) may be used to compare the differences in emotion regulation across Singaporeans and Australians. For in-depth understanding of the difficulties an individual experiences with emotion regulation, subscale scores may be used as it is more specific in its interpretation. We also showed that emotion regulation can be measured from different perspectives across Singaporean and Australian samples. All three questionnaires also had excellent internal consistency and relatively good concurrent validity with psychopathology and alexithymia across both samples, making them valid for use in research and in clinical contexts in Singapore and Australia.

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Author contributions

We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study.

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