Development and Validation of a State-Reappraisal Inventory (SRI)

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Reappraisal is a multifaceted construct associated with a wide range of proximal (e.g., affective responses) and distal (e.g., psychopathology) consequences. To date, our understanding of use of reappraisal is based either on self-reports of tendencies to use a specific strategy in general or in the last week or on performance on lab-based tasks. There has been little effort to measure use of reappraisal immediately following an emotionally evocative situation (i.e., state-reappraisal). To close this gap, we developed the State-Reappraisal Inventory (SRI) that ascertains use of reappraisal immediately after an emotional event. In Study 1, exploratory factor analyses yielded two reliable subscales measuring state levels of construal of an emotion-eliciting situating as more positive (Increase Positive) and less negative (Decrease Negative). In two further studies, confirmatory factor analyses using a bifactor model provided a good fit for the data and surpassed three competing models. In a fourth study, the SRI showed sensitivity to experimentally induced state changes in reappraisal. Across studies, the questionnaire demonstrated good convergent and discriminant validity. Thus, the SRI is a new measure of state-reappraisal that can allow researchers and clinicians to examine the extent to which individuals use reappraisal in emotional situations.

Public Significance Statement
The article reports on a series of studies describing the development and evaluation of the psychometric properties of a new self-report measure of state-reappraisal.

Keywords: emotion regulation, reappraisal, State-Reappraisal Inventory

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One emotion regulation strategy to use when feeling unpleasant emotions is to appraise the situation differently in a way that reduces the negative affect brought about by the situation. For example, receiving a low grade on an important exam can be appraised as an opportunity for growth instead of as a failure. This altered appraisal is termed reappraisal, denoting a change in the way a situation is construed to decrease its emotional impact (Gross, 2002; Gross & John, 2003).

Reappraisal can be construed as both a habitual tendency that refers to the way people typically respond to negative information or situations (i.e., trait-reappraisal), and it may also refer to the way people respond at a particular moment (state-reappraisal). Empirical findings attest to the effectiveness of reappraisal in both the short and the long term (Weber, Loureiro de Assunção, Martin, Westmeyer, & Geisler, 2014). Habitual use of reappraisal has been measured using a wide range of self-report questionnaires, such as the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), Cognitive Emotion Regulation Questionnaire (Garnefski & Kraaij, 2006, 2007), Thought Control Questionnaire (Wells & Davies, 1994), and coping inventory (COPE; Carver, Scheier, & Weintraub, 1989). Regardless of the measure, habitual reappraisal has been associated with good interpersonal functioning (Gross & John, 2003), adaptive reactions to anger (Mauss, Cook, Cheng, & Gross, 2007), high levels of positive emotions and low levels of negative emotions (Gross & John, 2003) and better well-being (e.g., Moore, Zoellner, & Mollenholt, 2008; Wiltink et al., 2011). Furthermore, habitual use of reappraisal has important clinical implications, because it is associated with lower levels of symptoms of psychopathology (Aldao, Nolen-Hoeksema, & Schweizer, 2010). There is also evidence to suggest that reappraisal may “inoculate” against depression, as reappraisal of stressful life events was associated with low levels of depressive symptoms (Troy, Wilhelm, Shallcross, & Mauss, 2010).

Experimentally manipulating reappraisal in lab settings has been shown to reduce self-reported negative affect (Grisham, Flower, Williams, & Moulds, 2011). Similar findings were reported concerning physiological and neurological markers of negative affect, such as corrugator (Urry, 2010), amygdala and insula activity (see

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Although reappraisal may be effective in both the short and the long term, there is evidence to suggest that habitual and state-reappraisal are not completely overlapping constructs. Whereas it is often assumed that habitual reappraisers will also be better able to use reappraisal in a given moment, this assumption has received only partial support. McRae, Jacobs, Ray, John, and Gross (2012) found that reappraisal ability in the lab and reappraisal frequency, are related but not redundant. Similarly, Quigley and Dobson (2014) found that although dysphoric individuals reported less frequent use of reappraisal compared to nondysphoric individuals, they were nevertheless able to use reappraisal effectively when instructed to do so. Thus, research is needed to better understand the differences and associations between habitual and state-reappraisal. Only a handful of studies examined contextual factors as well as individual differences that may affect the link between habitual and state-reappraisal, such as the use of self-compassion (Diedrich, Hofmann, Cuijpers, & Berking, 2016), working memory updating (Pe, Raes, and Kuppens [2013], and concurrent social stress Christensen, Aldao, Sheridan, & McLaughlin, 2017). One impediment to studying state-reappraisal is the lack of specific measures that assess this construct.

Indeed, the need for a measure that assesses state responses to emotions and allows researchers to explore the relationship between context and emotion regulation (ER) has been recently highlighted by Katz, Lustig, Assis, and Yovel (2017). These authors developed a brief measure of state ER including distraction, reappraisal, brooding and acceptance. Because this scale measures four different ER strategies, it can potentially be of great use in investigations of ER flexibility. However, a more in depth measure of state-reappraisal is needed to specifically target contextual and individual factors that moderate the link between habitual and state-reappraisal.

A measure of state-reappraisal may be useful in a number of important ways. First, prior research has examined individual differences in the ability to engage in reappraisal in a given moment, regardless of habitual reappraisal. This ability has been predicted by affective flexibility (the ability to flexibly attend to and disengage from emotional aspects of a situation or a stimulus; Malooly, Genet, & Siemer, 2013), habitual tolerance of negative affect (Germain & Kangà, 2015), fluid cognitive ability (Opitz, Lee, Gross, & Urry, 2014), dispositional mindfulness (Modinos, Ormè, & Aleman, 2010), and age (Phillips, Henry, Hoogie, & Milne, 2008; Shiota & Levenson, 2009). However, reappraisal use in these studies was assessed using indirect proxies of state-reappraisal, (e.g., mood and brain activity associated with ER). Second, the lack of a state-reappraisal measure is also evident when manipulations of state-reappraisal are considered (for a review, see Buhle et al., 2014). In most instances, no manipulation check is used to verify that indeed participants followed the reappraisal instructions. Open-ended descriptions of the strategies used by participants have revealed that a substantial number of participants report using strategies that are different from those they were instructed to use (Opitz, Cavanagh, & Urry, 2015). Thus, a measure that can provide an assessment of what participants do when they are asked to engage in reappraisal in the lab seems imperative. Despite limitations of self-report measures, a self-report measure of state-reappraisal can serve as a more direct and easy-to-use measure compared to coding of ER strategies based on self-reported thoughts. Finally, a handful of studies examined whether training can improve reappraisal and found encouraging results (e.g., Kivity & Huppert, 2016; Morris, Schueller, & Picard, 2015). A state-reappraisal measure may be useful in examining training effects and mechanisms of change.

Thus, the goal of the current article was to develop a brief self-report measure to assess state-reappraisal (the State Reappraisal Inventory [SRI]). Study 1 examined the factor structure of the SRI using an exploratory factor analysis and enabled item selection for a version of the SRI with an adequate factor structure. Study 2 tested the hypothesized factor structure using a confirmatory factor analysis and examined convergent validity of the SRI. Study 3 replicated the results of Study 2 using a Hebrew version of the SRI and Study 4 examined the sensitivity of the SRI to state changes in reappraisal using a laboratory experiment.

Scale Development

To generate the initial item pool, we followed the guidelines offered by Clark and Watson (1995). First, we generated a detailed conceptualization of state-reappraisal based on a thorough literature review. We relied on a broad and commonly used definition of reappraisal as modifying the way an emotion-eliciting situation is construed (see Gross, 2002; Gross & John, 2003; Mauss et al., 2007; Nezlek & Kuppens, 2008; Urry, 2009).

Changing the emotional impact of an emotion-eliciting situation is a broad conceptualization that may refer to change from a negative emotional stance to a less negative, more positive or nonemotional emotional stance. Although the latter, change to nonemotional or detached stance, has been widely studied (e.g., Richards & Gross, 2000; Ochsner, Bunge, Gross, & Gabrieli, 2002), it may be harder to implement after emotions have started to develop, and thus less ecological. Therefore, for the current investigation we are offering a definition of reappraisal as construal of an emotion-eliciting event as less negative or as more positive.

We refer to both construals (i.e., less negative, more positive) as two dimensions of the same construct (i.e., reappraisal), although they have also been conceptualized as two distinct subtypes of reappraisal (i.e., negative functional reappraisal and positive reappraisal; see Cristea, Tatar, Nagy, & David, 2012).

Our definition can be seen as somewhat parallel to the conceptualization offered by McRae, Ciesielski, and Gross (2012) that highlights the multifaceted nature of reappraisal in terms of emotional goals (i.e., to feel more positive emotions or less negative emotions). However, one can construe an emotion-eliciting event as less negative to feel more positive, and vice versa.

We based our items on questionnaires of habitual ER that assess reappraisal, including the ERQ (Gross & John, 2003), Difficult in Emotional Regulation Scale (Gratz & Roemer, 2004), Cognitive Emotion Regulation Questionnaire (Garnefski & Kraaij, 2006,
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DEVELOPMENT AND VALIDATION OF SRI

Method

Participants. The sample included 154 participants, recruited via Amazon Mechanical Turk, a web-based platform found to yield demographically diverse samples and reliable results (Buhrmester, Kwang, & Gosling, 2011). Participants were paid $1 for their participation and were all U.S. residents and English speakers with at least 1,000 approved assignments and 95% approval rate. Seven participants were excluded from the analyses because they did not perform the writing task properly. Thus, the final sample included 147 participants (53 males, 94 females; ages 19–75, \( M = 37, \ SD = 12.97 \)). This sample size sufficed for a power of 0.8, based on the framework for power analysis in the assessment of fit of covariance structure models offered by MacCallum, Browne, and Sugawara (1996). The study was approved by the university ethics committee.

Materials and procedure. Participants were given 4 min to recall and write about a personal event that occurred during the past 2–4 weeks, and induced feelings of sadness or regret, or that made them feel bad about themselves. Following the recall of the personal event, participants completed the 20-item SRI. Items were rated on a 1–5 Likert scale (1 = strongly disagree, 5 = strongly agree). Data were gathered using Qualtrics Version 04, 2015, a web-based survey platform.

Results and Discussion

Data reduction. An examination of item distributions showed that one item was skewed (40.1% replied “strongly disagree,” skewness > 1) and it was removed from all further analyses.

Factor analysis. The Kaiser–Meyer–Olkin measure of sampling adequacy was .9, above the commonly recommended value of .5, and Bartlett’s test of sphericity was significant, \( \chi^2(171) = 1,907.82, p < .001 \). Communalities were all above .3, further confirming that each item shared some common variance with other items. Thus, factor analysis was deemed to be suitable with all 19 items (Floyd & Widaman, 1995; Williams, Brown, & Onsman, 2012).

We used principal axis factoring to examine the underlying factor structure, because items were not distributed normally (Fabrigar, Wegener, MacCallum, & Strahan, 1999; Costello & Osborne, 2005). Based on Courtney and Gordon (2013) and Thompson and Daniel (1996), we compared several recommended methods to determine the number of factors (comparison data, parallel analysis, optimal coordinates, minimum average partial, acceleration factor). The comparison was inconclusive and we decided to use comparison data method, which was found to be the most accurate in identification of up to five factors (Ruscio & Roche, 2012). The method suggested two factors, and matched the scree plot.

We used promax rotation to allow factors to be correlated. The two factors explained 58.54% of the variance. The items that loaded on the first factor reflect the goal of having more positive emotions (e.g., “I try to think of positive consequences of the event”). The items that loaded on the second factor reflect the goal of having a less negative view (e.g., “The event is not as negative as I thought it was when it took place”). We examined item loadings and removed six items with a loading of .6 or less on each of the factors (Items 3, 4, 9, 14, 15, 17, 20). We chose a relatively strict criterion (Matsunaga, 2010) to reduce the number of items to a minimum to allow researchers to administer the SRI multiple times within the same experimental session.

We ran an exploratory factor analysis (EFA) using principal axis factoring with promax rotation on the remaining 12 items which yielded the same two factors. The two factors explained 64.8% of the variance, with a correlation of .3 between the factors. Internal consistency for each of the factors was found to be high: McDonald’s \( \omega = .93, 95\% \) confidence interval (CI) \([.9, .95]\) for increasing positive (seven items), McDonald’s \( \omega = .86, 95\% \) CI \([.84, .91]\) for reducing...
negative (five items). The factor-loading matrix for this final solution is presented in Table 1.\footnote{Valid N for all items is 147, and the range is 1–5.}

The two-factor model is consistent with the conceptualization of reappraisal as including both construal of the emotion-eliciting situation as more positive (Increase Positive) and as less negative (Decrease Negative). To confirm the two-factor model that our exploratory factor analysis yielded, we conducted a second study, on a new, independent sample.

### Study 2

The goals of the second study were to confirm the factor structure found in our EFA using a confirmatory factor analysis (CFA) and to examine the construct validity of the measure by exploring the association between scores on the SRI and measures of other constructs in the same nomological net of reappraisal.

#### Convergent Validity

Because there are currently no studies on the relationship between self-reported state-reappraisal and other constructs, our hypotheses were mainly based on associations reported between habitual reappraisal and related constructs. Specifically, based on associations between habitual reappraisal and psychopathology (Aldao et al., 2010), we predicted that state-reappraisal would be negatively correlated with symptoms of depression and anxiety and with worry.

Second, based on the assumption that participants will be at least partly successful in regulating their mood using reappraisal, we also expected that state-reappraisal would be positively correlated with positive mood and negatively correlated with negative mood.

Following the same rationale, we also expected state-reappraisal to be positively related to state self-esteem (Gross & John, 2003) and state-hope.

Finally, we were interested in examining the relationship between state-reappraisal and rumination, an ER strategy that involves passive and repetitive focus on one’s symptoms of distress (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Previous findings are inconsistent, with some studies finding a relationship between habitual rumination (e.g., Gross & John, 2003) and reappraisal, and others finding a positive correlation between them (e.g., Pe, Raes, & Kuppens, 2013). Thus, we did not have a specific hypothesis regarding the association between state-reappraisal and trait rumination.

#### Method

Participants. The sample included 250 participants, who were recruited via Amazon Mechanical Turk and were paid $2 for their participation. Participants were all U.S. residents and English speakers with at least 1000 approved assignments and 95% approval rate. Seventeen participants were removed from the analyses because they did not perform the experimental task properly, that is, they did not write a personal, negative event that occurred recently and evoked feelings of sadness or regret. Another participant was removed from analyses because of an outlying age ($SD > 3$). Thus, the final sample included 232 participants (123 males, 109 females; ages 18–66, $M = 35.91, SD = 10.82$). This sample size sufficed for a power of 0.8, based on the framework for power analysis in the assessment of fit of covariance structure models offered by MacCallum et al. (1996). The study was approved by the university ethics committee.

Materials.

- **State Reappraisal Questionnaire (SRI).** See D in the online supplemental material.
- **Depression Anxiety Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995).** The DASS-21 was used to assess depression, anxiety and stress. Each of the subscales consists of 7 items rated on a 4-point scale, and reflects participants’ feeling in the past week. Test scores have been reported to have high reliability (Antony, Bieling, Cox, Enns, & Swinson, 1998; Clara, Cox, & Enns, 2001) and sufficient construct validity (Henry & Crawford, 2005). Internal consistency of test scores in the current sample was high for depression, anxiety and stress subscales (Cronbach’s $\alpha = .92$, .88, and .89, respectively).

- **Positive and Negative Affect Schedule–State Version (PANAS; Watson, Clark, & Tellegen, 1988).** To measure positive and negative mood, we administered the PANAS, which consists of 20 items, half of which measure positive and half, negative mood. Participants rated the extent to which they experienced each mood state in that specific moment, using a 5-point Likert-type scale ranging from 1 (very slightly or not at all) to 5 (very much).

- **State-Hope Scale (Snyder et al., 1996).** The scale is composed of two subscales that reflect agency (belief in the ability to initiate and maintain actions) and pathways (belief in the ability to create pathways to achieve goals). It includes six items (three items on each subscale) that are rated on a 1–8 Likert scale. Internal consistency of test scores in the current sample was high for both negative (Cronbach’s $\alpha = .93$) and positive (Cronbach’s $\alpha = .92$) mood.

- **State Self-Esteem Scale (McFarland & Ross, 1982).** The scale includes 12 adjectives, five negative and seven positive. Subjects are asked to rate the degree to which each adjective reflects the way they feel now. Internal consistency of test scores in the current sample was high for both negative (Cronbach’s $\alpha = .93$) and positive (Cronbach’s $\alpha = .96$) self-esteem.

- **Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990).** The questionnaire includes 16 items rated on a 1–5 Likert scale. The PSWQ test scores were found to have high internal and test–retest reliabilities (Molina & Borkovec, 1994). Internal consistency of test scores in the current sample was high (Cronbach’s $\alpha = .96$).

- **The Ruminative Responses Scale (RRS; Nolen-Hoeksema & Morrow, 1991).** This is a 22-item questionnaire that assesses the tendency to engage in ruminative thinking in response to negative mood. Internal consistency of the rumination scale scores across the entire sample was good (Cronbach’s $\alpha = .87$).

- **Procedure.** The procedure was similar to the procedure in Study 1. Data was gathered online using Qualtrics Version 04, 2015. Following informed consent, participants were asked to recall a recent personal event that evoked feelings of sadness or
regret. Subsequently, they completed the SRI, followed by the self-report questionnaires.2

Results and Discussion

Skewness and kurtosis were in the recommended range (≤1.5) for performing maximum likelihood (ML) analysis for items on an ordinal scale (Schumacker & Lomax, 2004). CFA with ML was performed using lavaan package (Rosseel, 2012) in RStudio Version 1.0.136 (RStudio Team, 2015).

The metric of each latent variable was determined by fixing their (residual) variances to 1.3 We fit a bifactor model (a.k.a. a general-specific model) of state-reappraisal. As shown in Figure 1, all items loaded moderately on a general state-reappraisal factor.

We examined the goodness of fit of our bifactor model using several fit indices: chi-square (Bollen, 1989), root mean square error of approximation (RMSEA < .06 to .09), standardized root mean square residual (SRMR ≤ .08), comparative fit index (CFI ≥ .95), and the Tucker–Lewis index (TLI ≥ .9). The indicated values represent good fit (Hu & Bentler, 1999; Schreiber, Nora, Stage, Barlow, & King, 2006).The model provided good fit for the data: χ²(42, N = 231) = 144.02, p < .0001, RMSEA = .1, 90% CI [.08, .12], p < .0001, SRMR = .05, CFI = .95, TLI = .92.

We then examined the goodness of fit of three competing models: a model with two dependent factors, a model with two orthogonal factors, and a model with a single factor. Neither of the models provided an adequate fit for the data (see Table 2).

We conducted a comparison of the original bifactor model and the three competing models using a chi-square difference test. The bifactor model provided a better fit for the data compared to the dependent factors model, χ²(11) = 185.1, p < .0001, the orthogonal model, χ²(11) = 185.1, p < .0001, and the one factor model, χ²(12) = 544.79, p < .0001.

MacDonald’s omega was high both for the Increase Positive subscale (ω = .91, 95% CI [.88, .93]), the Decrease Negative subscale (MacDonald’s ω = .88, 95% CI [.84, .91]), and the SRI total score (MacDonald’s ω = .92, 95% CI [.89, .93]).

To estimate not only the proportion of variance attributable to all sources of common variance (omega) but also the proportion of variance in total scores that can be attributed to a single general factor, we also computed coefficient OmegaH, which treats variability in scores due to group factors as measurement error (McDonald, 2000; Zinbarg, Revelle, Yovel, & Li, 2005; Zinbarg, Yovel, Revelle, & McDonald, 2006). OmegaH was 0.63, which means that 63% of the variance of unit-weighted total scores can be attributed to the individual differences on the general factor; when compared to omega of 0.92 it is clear that a considerable part of the reliable variance in total scores cannot be attributed to the general factor. Thus, raw total scores can be interpreted as essentially multidimensional.

For additional information on the reliability of subscale scores and the sources of reliable variance (general vs. dimensions), we also computed OmegaHS, an index reflecting the reliability of a subscale score after controlling for the variance due to the general factor (Reise, Bonifay, & Haviland, 2013).

OmegaHS values were low for both subscales (0.38, 0.42), especially when compared to their corresponding omega values (0.88, 0.91). Thus, the apparent reliability of subscales judged by coefficient omega can be mostly attributable to individual differences on the general factor.

To further assess the essential unidimensionality of the common variance, we also calculated the explained common variance (ECV; Sijtsma, 2009), which indexes the percent of common variance explained by the general factor. This is a degree of unidimensionality index and is directly related to the relative strength of the general factor (Rodriguez, Reise, & Haviland, 2016). The ECV for the SRI was 0.54, indicating a moderate general factor (Reise, 2012). The ECV is moderated by the percent of uncontaminated correlations (PUC), which provides information on the conditions under which bias in parameter estimates is more or less acute. PUC

2 The order of the questionnaires administered was SRI, DASS, ERQ, PANAS, PSWQ, RRS, State Hope Scale, State Self-Esteem Scale.
3 We constrained the latent factors to have a mean of 0 and a variance of 1 (i.e., standardized them) so that latent covariances are easier to interpret. Fixing the residuals of latent variables to 1 and fixing one factor loading per latent variable gave equivalent results.
in the current data was 0.53, suggesting that a unidimensional model cannot be fit to the data without potential for bias (Reise, Scheines, Widaman, & Haviland, 2013; Bonifay, Reise, Scheines, & Meijer, 2015). Thus, despite OmegaHS values, ECV and PUC estimates do not seem to support a unidimensional conceptualization of state-reappraisal.

Finally, we assessed factor determinacy using the FD measure. Factor determinacy refers to the degree to which individual differences on the factor score estimates are good representations of true individual differences on the factor. In the context of a bifactor model, the determinacy of the group factors is more of a concern compared to the determinacy of the general factor (Rodriguez et al., 2016). FD measures for group factors in the current sample were 0.75, 0.76, indicating moderate determinacy.

Convergent Validity.

Correlational analysis. As expected, we found negative, albeit small, correlations between the SRI (total score, Increase Positive subscale, Decrease Negative subscale) and subscales of stress and anxiety on the DASS, as well as with negative mood. Negative, albeit small, correlations were also found between the SRI (total score and Increase Positive subscale, but not the Decrease Negative subscale) and low self-esteem, as well as worry. In accordance with our hypotheses, there was also a positive correlation between the SRI (total score, Increase Positive subscale, Decrease Negative subscale) and positive mood, both subscales of the state-hope scale (pathways, agency) and positive self-esteem (see E in the online supplemental material). We did not find significant correlation between the SRI and depression or rumination.

Structural equation modeling analyses. Convergent and discriminant validity were examined using structural equation modeling with ML. Analyses were run using lavaan package (Rosseel, 2012) in RStudio Version 1.0.136 (RStudio Team, 2015). Convergent and discriminant validity were assessed using Fornell and Larcker (1981) criteria, which require the average variance extracted (AVE) to be greater than 0.5 (convergent validity) and greater than shared variance (discriminant validity).

<table>
<thead>
<tr>
<th>Model</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA [90% CI]</th>
<th>SRMR</th>
<th>χ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bifactor</td>
<td>.92</td>
<td>.95</td>
<td>.1 [.08, .12]</td>
<td>.05</td>
<td>144.02</td>
</tr>
<tr>
<td>Two dependent factors</td>
<td>.82</td>
<td>.86</td>
<td>.15 [.135, .17]</td>
<td>.08</td>
<td>329.12</td>
</tr>
<tr>
<td>Two orthogonal factors</td>
<td>.82</td>
<td>.86</td>
<td>.15 [.135, .17]</td>
<td>.08</td>
<td>329.12</td>
</tr>
<tr>
<td>One factor</td>
<td>.67</td>
<td>.6</td>
<td>.23 [.21, .24]</td>
<td>.13</td>
<td>688.81</td>
</tr>
</tbody>
</table>

Note. TLI = Tucker–Lewis index; CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval; SRMR = standardized root mean square residual.
State-reappraisal (total score) was positively correlated with state-hope (total score, pathways, agency) and high self-esteem, and negatively correlated with depression, low self-esteem and negative mood. All AVE values were greater than 0.5, except for rumination (see Table 3). Shared variance between rumination and state-reappraisal (total score; 0.01), increase positive state-reappraisal (0.0001) and decrease negative state-reappraisal (0.0002) was lower than AVE. For all variables, coefficient omega (Raykov, 2001) was high (>0.85).

In sum, the bifactor model provided good fit for the data and surpassed the three competing (one factor, two orthogonal factors, two dependent factors) models. The questionnaire demonstrated modest convergent validity (depression, anxiety, stress, worry, state-hope, self-esteem and mood) and some degree of discriminant validity (rumination).

It should be noted that correlations among variables in our study were relatively small. Nevertheless, they are comparable with correlations reported in prior research between habitual reappraisal and other ER strategies or outcomes (e.g., depression and anxiety; e.g., Gross & John, 2003).

Study 3

Given that scales are typically translated into multiple languages, we saw it as an advantage to examine the psychometrics of a Hebrew translation of the SRI including its factor structure. In addition, some researchers advocate for use of a visual analogue scale (VAS) over a Likert scale (e.g., Lishner, Cooter, & Zald, 2008), we decided to examine a VAS in this version. Furthermore, we planned on examining the sensitivity of the SRI in the lab (with Hebrew speaking participants) when instructed to use reappraisal, and therefore it was necessary to first examine the factor structure of the SRI in Hebrew. Given the importance of reappraisal, and therefore it was necessary to first examine the lab (with Hebrew speaking participants) when instructed to use reappraisal, and therefore it was necessary to first examine the factor structure of the SRI in Hebrew. Given the importance of examining the relationship between state and trait reappraisal, we examined this relationship as well.

<table>
<thead>
<tr>
<th>Measure</th>
<th>State-reappraisal</th>
<th>β</th>
<th>SE</th>
<th>χ^2(df)</th>
<th>AVE</th>
<th>Raykov’s ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>DASS–Depression</td>
<td>−3.3***</td>
<td>.09</td>
<td>288.04 (137)</td>
<td>.62</td>
<td>.93</td>
<td></td>
</tr>
<tr>
<td>DASS–Anxiety</td>
<td>−.05</td>
<td>.07</td>
<td>307.66 (137)</td>
<td>.5</td>
<td>.94</td>
<td></td>
</tr>
<tr>
<td>DASS–Stress</td>
<td>−.13</td>
<td>.09</td>
<td>310.6 (137)</td>
<td>.54</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>PSWQ–Worry</td>
<td>−.13</td>
<td>.09</td>
<td>816.66 (335)</td>
<td>.64</td>
<td>.97</td>
<td></td>
</tr>
<tr>
<td>RRS–Rumination</td>
<td>−.11</td>
<td>.08</td>
<td>566.71 (194)</td>
<td>.42</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>SHS–Total</td>
<td>−.29***</td>
<td>.08</td>
<td>300.27 (120)</td>
<td>.71</td>
<td>.93</td>
<td></td>
</tr>
<tr>
<td>SHS–Pathways</td>
<td>−.22**</td>
<td>.09</td>
<td>191.34 (75)</td>
<td>.69</td>
<td>.87</td>
<td></td>
</tr>
<tr>
<td>SHS–Agency</td>
<td>−.33**</td>
<td>.08</td>
<td>177.39 (75)</td>
<td>.79</td>
<td>.92</td>
<td></td>
</tr>
<tr>
<td>SES–High</td>
<td>−.22**</td>
<td>.09</td>
<td>319.02 (137)</td>
<td>.76</td>
<td>.96</td>
<td></td>
</tr>
<tr>
<td>SES–Low</td>
<td>−.2**</td>
<td>.07</td>
<td>205.39 (89)</td>
<td>.78</td>
<td>.93</td>
<td></td>
</tr>
<tr>
<td>PANAS–Positive</td>
<td>.19</td>
<td>.12</td>
<td>526.68 (194)</td>
<td>.54</td>
<td>.92</td>
<td></td>
</tr>
<tr>
<td>PANAS–Negative</td>
<td>−.2**</td>
<td>.07</td>
<td>507.84 (194)</td>
<td>.6</td>
<td>.94</td>
<td></td>
</tr>
</tbody>
</table>

Note. AVE = average variance extracted; DASS = Depression Anxiety Stress Scale; PSWQ = Penn State Worry Questionnaire; RRS = Rumination Responses Scale; SHS = State-Hope Scale; SES = State Self-Esteem Scale; PANAS = Positive and Negative Affect Scale. "p < .05. ** p < .01. *** p < .001; all χ^2 tests were significant at p < .0001.

Method

Participants. Hebrew-speaking students (N = 188) participated in the study (150 females, ages 19–30, M = 23.02, SD = 1.87) in return for course credit or a monetary prize (via a raffle). The study was approved by the university ethics committee.

Materials. We translated the SRI into Hebrew and then back-translated it to English to check the veracity of the translation. Trait and state questionnaire were the same as in Study 2, with the exception that state measures (SRI, mood, hope and self-esteem) were measured using a VAS and the addition of the trait ERQ (Gross & John, 2003).

Procedure. As in Studies 1 and 2, all measures were administered online.

Results and Discussion

Skewness and kurtosis were in the recommended range (<1.5) for performing ML analysis for items on an ordinal scale (Schmacker & Lomax, 2004). CFA with ML was performed using lavaan package (Rosseel, 2012) in RStudio Version 1.0.136 (RStudio team, 2015).

First, we examined the bifactor model found in our EFA and first CFA, including two orthogonal factors and one general state-reappraisal factor. The metric of each latent variable was determined by fixing their (residual) variances to 1. The model provided a good fit for the data: χ² (42, N = 236) = 118.08, p < .0001, RMSEA = .09, 90% CI [.07, .11], SRMR = .05, CFI = .95, TLI = .92.

As in Study 2, we examined the goodness of fit of three competing models: a model with two dependent factors, a model with two orthogonal factors and a model with a single factor. None of the other models provided an adequate fit for the data (see Table 4).

Finally, we conducted a comparison of the bifactor model and the three competing models using a chi-square difference test. The bifactor model provided a better fit for the data compared to the two dependent factors model, χ²(11) = 102.05, p < .0001, the orthogonal model, χ²(11) = 102.05, p < .0001, and the one factor model, χ²(12) = 417.08, p < .0001.

MacDonald’s omega was high both for the Increase Positive subscale (MacDonald’s ω = .89, 95% CI [.85, .92]), the Decrease Negative subscale (MacDonald’s ω = .85, 95% CI [.81, .88]), and the SRI total score (MacDonald’s ω = .88, 95% CI [.84, .91]).

As in Study 2, we also computed OmegaH to estimate the proportion of variance in total scores that can be attributed to a single general factor. OmegaH was 0.53, which means that 53% of the variance of unit-weighted total scores can be attributed to the individual differences on the general factor; when compared to Omega of 0.88 it is clear that a considerable part of the reliable variance in total scores cannot be attributed to the general factor. Thus, raw total scores can be interpreted as essentially multidimensional. OmegaHS values were low for both subscales (0.49, 0.45), especially when compared to their corresponding omega values (0.89, 0.85). Despite OmegaHS values, ECV (0.45) and PUC (0.53) estimates do not seem to support a unidimensional conceptualization of state-reappraisal. Finally, FB measures for group factors in the current sample were 0.79, 0.77, indicating moderate determinacy.
### Table 4
Goodness-of-Fit Indices for the Original Model and Three Competing Models (Study 3)

<table>
<thead>
<tr>
<th>Model</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA [90% CI]</th>
<th>SRMR</th>
<th>χ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bifactor</td>
<td>.92</td>
<td>.95</td>
<td>.09 [.07, .11]</td>
<td>.05</td>
<td>118.08</td>
</tr>
<tr>
<td>Two dependent factors</td>
<td>.87</td>
<td>.89</td>
<td>.12 [.11, .13]</td>
<td>.08</td>
<td>220.13</td>
</tr>
<tr>
<td>Two orthogonal factors</td>
<td>.87</td>
<td>.89</td>
<td>.12 [.11, .13]</td>
<td>.08</td>
<td>220.13</td>
</tr>
<tr>
<td>One factor</td>
<td>.625</td>
<td>.69</td>
<td>.19 [.18, .21]</td>
<td>.135</td>
<td>535.16</td>
</tr>
</tbody>
</table>

Note. TLI = Tucker–Lewis index; CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval; SRMR = standardized root mean square residual.

To further test our hypothesis concerning the fit of the bifactor model we ran a multi-Group CFA analysis comparing the two samples (Study 2, Study 3). To examine the significance of the ΔCFI we used the revised cut-off of .002 recommended by Meade, Johnson, and Braddy (2008). The series of model comparisons (see Table 5) suggested that the criteria for configural, weak, and strong invariance were met, but the criteria for strict invariance was not. That is, across groups, the pattern of fixed and free parameters, corresponding factor loadings, and corresponding indicator means were all equivalent. However, corresponding indicator residuals were not (Brown, 2014). Although the SRI did not meet the criterion for strict invariance, researchers suggest that this may be an overly stringent criterion (Hirschfeld & Von Brachel, 2014).

### Convergent validity.

**Correlational analysis.** As in Study 2, scores on the Hebrew version of the SRI were positively correlated with positive mood, state-hope and high self-esteem, and negatively correlated with negative mood, low self-esteem, anxiety, worry, and stress. As in Study 2, the SRI did not correlate with rumination. In addition, we found a positive correlation with habitual reappraisal and negative correlations with depression and suppression (see F in the online supplemental material).

**Structural equation modeling analyses.** State-reappraisal was positively correlated with habitual reappraisal, state-hope (total score, pathways, agency), high self-esteem and positive mood; it was negatively correlated with depression, anxiety, stress, worry, suppression, low self-esteem, and negative mood.

As in Study 2, convergent and discriminant validity were assessed using Fornell-Larcker’s (1981) criteria. AVE values were greater than 0.5 for depression, suppression, state-hope (total score, pathways, agency), and self-esteem (high, low), see Table 6. Shared variance between rumination and state-reappraisal (total score; 0.003), increase positive state-reappraisal (<0.0001) and decrease negative state-reappraisal (0.03) was lower than AVE.

### Table 5
Multigroup Confirmatory Factor Analysis Fit Statistics

<table>
<thead>
<tr>
<th>Model</th>
<th>χ²(Δχ²)</th>
<th>df(Δdf)</th>
<th>p(Δp)</th>
<th>CFI (ΔCFI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–Configural</td>
<td>262.11</td>
<td>84</td>
<td>&lt;.0001</td>
<td>.95</td>
</tr>
<tr>
<td>2–Weak invariance</td>
<td>(39.63)</td>
<td>(21)</td>
<td>(.008)</td>
<td>(.005)</td>
</tr>
<tr>
<td>3–Strong invariance</td>
<td>(0)</td>
<td>(9)</td>
<td>(.99)</td>
<td>(.003)</td>
</tr>
<tr>
<td>4–Strict invariance</td>
<td>(0)</td>
<td>(3)</td>
<td>(.99)</td>
<td>(.001)</td>
</tr>
</tbody>
</table>

Note. CFI = comparative fit index.

For all variables, coefficient omega (Raykov, 2001) was high (>0.78).

In sum, the CFA performed on the Hebrew version of the SRI replicated the results of the English version of the measure. The bifactor model was superior to the two dependent factors, two independent factors and one-factor models. The questionnaire demonstrated good convergent validity (for habitual reappraisal, depression, anxiety, stress, worry, suppression, state-hope, self-esteem and mood) and some degree of discriminant validity (rumination).

To further explore the sensitivity of the SRI to experimental manipulation we conducted a fourth study, in which we added for the first time explicit instructions to reappraise, as well as a control condition with a different ER strategy. This allowed us to examine whether the SRI is sensitive to changes in reappraisal following explicit instructions to reappraise, and whether observed fluctuations in the SRI are specific to reappraisal induction (rather than any ER strategy).

### Study 4

The fourth study was conducted to examine the criterion validity of the SRI via an examination of its sensitivity to state changes in reappraisal in the laboratory. This study examined state-reappraisal before and after participants ruminated about a personal negative event or reappraised the meanings of this event. To date, most studies do not use a manipulation check to verify that indeed participants follow reappraisal instructions. Therefore, the current study provides justification for using the SRI in experimental research.

We compared changes in reappraisal following a reappraisal induction to changes in reappraisal following a rumination manipulation. Rumination was chosen as a control condition because even though reappraisal and rumination lead to opposite outcomes...
(i.e., reappraisal is considered adaptive and rumination-maladaptive; for a meta-analysis, see Aldao et al., 2010), both reappraisal and rumination involve active processing of the emotion-eliciting event (unlike distraction, e.g., in which attention is diverted away from the emotion). Furthermore, it has been suggested that these strategies may share a common cognitive process (Cohen, Duches, Mor, & Henik, 2014).

**Method**

**Participants.** Eighty-seven Hebrew-speaking students participated in the study in return for course credit or a small payment. One participant was removed from the analyses due to improper performance on the writing task. Thus, the final sample included 86 participants (48 females, ages 18–43, M = 23.5, SD = 2.98). The study was approved by the university ethics committee.

**Procedure.** Participants were randomly assigned to one of two conditions: rumination or reappraisal. As in the previous studies, participants were asked to write about a negative personal event. Then, they were instructed to regulate their emotions using the ER strategy ascribed by the experimental condition. State-rumination and mood were measured at three times: baseline, following the mood induction (thinking about the event) and following the regulation period. State-reappraisal was measured on the last two time points. After the third measurement of state-rumination and mood, participants were asked to complete the trait questionnaires (BDI, RRS, ERQ, and PSWQ). Finally, participants were questioned to assess the effectiveness of the ER manipulation, and to identify participants who were aware of the purpose of the experiment.

**Materials.**

**ER manipulation.** As in the previous two studies, participants (in both the rumination and reappraisal conditions) were given three minutes to recall a recent upsetting personal event and write about it. Then, ER instructions for each of the experimental conditions were presented on the computer monitor.4 Rumination and reappraisal instructions were adapted from Davidovitch, Mor, and Yovel (2014). Participants were allotted three minutes to write a description of the manner in which they regulated their emotions following the upsetting event. Two blind coders rated the compatibility of the written descriptions (of both the events and regulation) to the experimental instructions. Interrater reliability of ratings was high for both the events (97.96% agreement) and the regulations (94.79% agreement). Raters also rated negativity and positivity of the written events and regulation (rumination or distraction) descriptions, on a scale of 1–9. Interrater reliability of regulation negativity (r = .88) and positivity (r = .92) ratings was also high.

**State questionnaires.** All state questionnaires were rated using a VAS.

**State-reappraisal.** State-reappraisal was measured using the Hebrew version of the SRI. Internal consistency was good in both measurements (total score: .88, .93; Increase Positive subscale: .87, .88; Decrease Negative subscale: .83, .89).

**State-rumination.** State-rumination was measured using an adapted 5-item version of the Brief State Rumination Inventory, which is an eight-item scale that was shown to have good psychometric properties as well as construct and concurrent validity (Marchetti, Mor Chiorri, & Koster, 2018). Internal consistency in the current study was good in all measurements (Cronbach’s α = .84, .77, and .82).

**Mood.** Mood was measured using four negative (sad, depressed, moody) and three positive (happy, joyful, enthusiastic) items adapted from the PANAS.5 Internal consistency for negative mood (.87 < Cronbach’s α < .91) and for positive mood (.90 < Cronbach’s α < .93) was good in all measurements.

**Trait questionnaires.** The study included several trait questionnaires tapping into habitual emotional and ER tendencies, to examine whether these variables moderate the effect of an ER induction (rumination vs. reappraisal) on state-reappraisal. These included the PSWQ (Meyer et al., 1990), BDI-II (Beck, Steer, & Brown, 1996), the RRS (Nolen-Hoeksema & Morrow, 1991) and the ERQ (Gross & John, 2003). Internal consistency of test scores in these measures was high (Cronbach’s α: PSWQ = .93, Cronbach’s α: BDI-II = .87, Cronbach’s α: RRS = .91, Cronbach’s α: Brooding = .93, Cronbach’s α: Reflection = .79, Cronbach’s α: Suppression = .87, Cronbach’s α: Reappraisal = .81).

**Results and Discussion**

**Manipulation checks.** The two raters rated the written events as significantly negative, t(85) = 84.01, p < .0001, 95% CI [6.57, 6.89], suggesting that on average, participants indeed reported events that elicited negative emotions. Paired-samples t tests showed that writing about the negative event successfully manipulated negative mood, t(85) = 6.67, p < .0001, 95% CI [9.17, 16.96], d = 0.71, positive mood, t(85) = −7.16, p < .0001, 95% CI [−12.29, −6.95], d = 0.77, and state-rumination, t(85) = 5.12, p < .0001, 95% CI [5.02, 11.38], d = 0.85.

Raters also rated written descriptions following reappraisal as significantly less negative t(84) = 11.72, p < .0001, 95% CI [3.05, 4.29], d = 2.53 and more positive, t(84) = −12.24, p < .0001, 95% CI [−4.47, −3.22], d = 2.65, than written descriptions following rumination. Mixed design ANOVAs with positive mood, negative mood and state-rumination as within-subjects variables and condition (rumination, reappraisal) as a between-subjects variable showed that condition significantly interacted with all three variables, F(1, 85) = 12.85, p = .001, .0001, 95% CI [−4.47, −3.22], d = 2.65, than written descriptions following rumination. Mixed design ANOVAs with positive mood, negative mood and state-rumination as within-subjects variables and condition (rumination, reappraisal) as a between-subjects variable showed that condition significantly interacted with all three variables, F(1, 85) = 12.85, p = .001, .0001, 95% CI [−4.47, −3.22], d = 2.65, than written descriptions following rumination.

4 Ruminations: Now, we ask you to think of the event you described in a more construed way, and deepen your understanding of the event. To do so, you can think over and over again on the things that made you feel the way that you did and react the way that you did. You can also think why you have not dealt with the event better? Why these things keep happening to you? What is it about you that made things happen the way they did? Why do you react this way to such incidents? Why do you react this way to such incidents?

5 We used a shortened version of the PANAS to facilitate multiple measurements throughout the study.
neither subscale, mean difference
increase positive
95% CI [7.28, 17.46],
Positive mood 33.69 (17.19) 33.88 (18.95) .09 [3.77, mean difference
difference increase
difference decrease
increase positive
difference decrease
CI [−2.33, 4.14], d = 0.08 (see Figure 2). Independent samples t tests also showed that the groups did not differ in state-reappraisal prior to the regulation period (mean difference reappraisal = 0.77, SE = 4.11), (t(84) = 0.19, p = .85, 95% CI [−1.72, 2.74], d = 0.04, but they did differ following the regulation induction (mean difference reappraisal = 9.7, SE = 4.24), (t(84) = 2.29, p = .02, 95% CI [1.27, 18.13], d = 0.5.

A similar pattern was found for both subscales. Participants in the reappraisal condition displayed significant elevations in both the Increase Positive and Decrease Negative subscales, mean difference = 8.03, SD = 11.32, (t(38) = 4.43, p < .0001, 95% CI [4.36, 11.7], d = 0.71; mean difference = 12.37, SD = 15.7, (t(38) = 4.92, p < .0001, 95% CI [7.28, 17.46], d = 0.79, respectively. In contrast, participants in the rumination condition did not display significant changes in neither subscale, mean difference increase positive = −0.32, SD = 10.81, (t(46) = −0.2, p = .84, 95% CI [−3.49, 2.86], d = 0.03; mean difference decrease negative = 2.62, SD = 13.41, (t(46) = 1.34, p = .19, 95% CI [−1.32, 6.55], d = 0.2. See Table 8 for descriptive statistics of both subscales.

Independent samples t tests showed that the groups did not differ in the Increase Positive subscale or the Decrease Negative subscale prior to the regulation period (mean difference = 0.75, SE = 4.31, (t(84) = 0.17, p = .86, 95% CI [−7.81, 9.32], d = 0.04; mean difference = 0.78, SE = 4.22, (t(84) = 0.19, p = .85, 95% CI [−14.91, 6.22], d = 0.03. In contrast, participants in the rumination condition showed significant elevations in state-reappraisal following the regulation period (see Table 7).

**Effects of rumination and reappraisal on state-reappraisal.**

Mixed design ANOVA with time as a within-subjects variable and condition (rumination, reappraisal) as a between-subjects variable was conducted to examine whether the SRI is sensitive to changes in reappraisal following ER manipulation. Condition significantly interacted with time, F(1, 84) = 12.35, p = .001, η² = .13.

Results of paired samples t tests also showed that participants in the reappraisal condition showed significant elevations in state-reappraisal following the reappraisal induction (mean difference = 9.84, SD = 12.55), (t(38) = 4.9, p < .0001, 95% CI [5.77, 13.9], d = 0.78, whereas participants in the rumination condition did not (mean difference = 0.91, SD = 11.01), (t(46) = 0.56, p = .57, 95% CI [−2.33, 4.14], d = 0.08 (see Figure 2). Independent samples t tests also showed that the groups did not differ in state-reappraisal prior to the regulation period (mean difference reappraisal = 0.77, SE = 4.11), (t(84) = 0.19, p = .85, 95% CI [−1.72, 2.74], d = 0.04, but they did differ following the regulation induction (mean difference reappraisal = 9.7, SE = 4.24), (t(84) = 2.29, p = .02, 95% CI [1.27, 18.13], d = 0.5.

A similar pattern was found for both subscales. Participants in the reappraisal condition displayed significant elevations in both the Increase Positive and Decrease Negative subscales, mean difference = 8.03, SD = 11.32, (t(38) = 4.43, p < .0001, 95% CI [4.36, 11.7], d = 0.71; mean difference = 12.37, SD = 15.7, (t(38) = 4.92, p < .0001, 95% CI [7.28, 17.46], d = 0.79, respectively. In contrast, participants in the rumination condition did not display significant changes in neither subscale, mean difference increase positive = −0.32, SD = 10.81, (t(46) = −0.2, p = .84, 95% CI [−3.49, 2.86], d = 0.03; mean difference decrease negative = 2.62, SD = 13.41, (t(46) = 1.34, p = .19, 95% CI [−1.32, 6.55], d = 0.2. See Table 8 for descriptive statistics of both subscales.

Independent samples t tests showed that the groups did not differ in the Increase Positive subscale or the Decrease Negative subscale prior to the regulation period (mean difference = 0.75, SE = 4.31, (t(84) = 0.17, p = .86, 95% CI [−7.81, 9.32], d = 0.04; mean difference = 0.78, SE = 4.22, (t(84) = 0.19, p = .85, 95% CI [−14.91, 6.22], d = 0.03. In contrast, participants in the rumination condition showed significant elevations in state-reappraisal following the regulation period (see Table 7).

**Figure 2.** Changes in state-reappraisal before and after the regulation period. Error bars represent standard errors.

CI [−7.61, 9.18], d = 0.04, respectively, but they did differ following the regulation period, mean difference = 9.1, SE = 4.18, (t(84) = 2.17, p = .03, 95% CI [0.78, 17.42], d = 0.47; mean difference = 10.54, SE = 4.61, (t(84) = 2.28, p = .02, 95% CI [1.36, 19.71], d = 0.5, respectively.

**Associations with trait questionnaires.**

Correlations between trait questionnaires and baseline state-reappraisal (total score, Increase Positive subscale, Decrease Negative subscale) are presented in Table 9. Baseline state-reappraisal was positively correlated with habitual reappraisal (total score, Increase Positive subscale) and negatively correlated with suppression. Depression scores were also negatively correlated with state-reappraisal (total score, Increase Positive subscale).

In sum, participants’ scores on the SRI increased following a reappraisal induction but not a rumination induction. A similar pattern emerged for both subscales of the SRI. Additionally, measures of depression and trait suppression were negatively correlated with the Increase Positive subscale and not the Decrease Negative subscale.

Results of this study show that the SRI is sensitive to state changes in reappraisal. They also suggest that the Increase Positive and Decrease Negative subscales of the SRI may be differently related to measures of habitual ER (e.g., depression and suppression).

**General Discussion.**

The primary goal of the present research was to develop and provide support for the psychometric properties of a SRI that
could tap into momentary changes in reappraisal. Results of the studies suggest that the SRI is a psychometrically sound instrument with two subscales: increase positive emotions and decrease negative emotions (Studies 1–3). Studies 2 and 3 showed that the bifactor model provided a good fit for the data and surpassed the three competing (one factor, two orthogonal factors, two dependent factors) models. Statistical indices derived from the bifactor model showed moderate determinacy and did not support a unidimensional conceptualization of state-reappraisal.

These studies also demonstrated that the questionnaire had modest convergent validity (anxiety, stress, state-hope, self-esteem, worry, habitual reappraisal, suppression, mood and depression) and some degree of discriminant validity (rumination). Convergent and discriminant validity of the SRI were further supported by a structural equation modeling analyses using Cornell-Larcker (1981) criteria. Moreover, we found that worry (Studies 2 and 3) and suppression (Studies 3 and 4) may be related to Increase Positive state-reappraisal and not to Decrease Negative state-reappraisal (simple correlations).

Finally, Study 4 provided experimental support for the sensitivity of the SRI to induced changes in state-reappraisal. Specifically, participants experienced elevations in negative mood and state-rumination following recall of a negative personal event. Participants were instructed explicitly to regulate their emotions using either rumination or reappraisal. Changes in mood and state-rumination were evident following this brief regulation period. Importantly, participants’ scores on the SRI were elevated following instructed reappraisal but not rumination. A similar pattern emerged for both subscales of the SRI.

However, the subscales were differentially related to habitual depression and suppression, such that depression and suppression were more highly correlated with Increase Positive state-reappraisal compared to Decrease Negative state-reappraisal.

Together, these studies provide initial evidence for the validity of the SRI as a measure of state-reappraisal. The bifactor model is consistent with the classification offered by Cristea et al. (2012) that differentiates between two types of induced reappraisal: positive reappraisal and negative functional reappraisal. The first refers to pointing out the positive aspects of an emotion-provoking situation and the second refers to considering the undesirable aspects in a more functional, less malignant way.

Thus, the two dimensions of state-reappraisal may also help researchers discern specific dimensions of reappraisal that are more or less efficient in reducing negative or increasing positive affect over time (i.e., across different measurements), or in response to different negative emotions (e.g., anger or sadness). Given its two-factor structure, the SRI also holds promise for better understanding differences between various regulation goals (i.e., to increase negative affect or reduce negative affect) and tactics. For example, Increase Positive state-reappraisal may perhaps be more closely related to “explicitly positive” tactic, while Decrease Negative state-reappraisal may be more closely related to “technical” tactics (see McRae, Ciesielski, et al., 2012).

Our findings that worry and suppression are negatively associated with Increase Positive state-reappraisal and not with Decrease Negative state-reappraisal may imply that habitual emotional and ER tendencies, usually considered maladaptive, are associated with less use of ‘positive’ regulation goals and tactics.

Given the bifactor structure of the SRI, the overall state-reappraisal factor holds potential to enhance our understanding of the relationship between state-reappraisal and habitual use of reappraisal as well as other forms of ER. It may be especially helpful in examining contextual moderators (e.g., stress) of state-trait associations and better understanding the acquisition or improvement of reappraisal ability. Using the SRI in laboratory settings

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Table 8

Means and Standard Deviations for the State-Reappraisal Inventory Subscales in Both Conditions and Time Points (Study 4)

<table>
<thead>
<tr>
<th>SRI Subscales</th>
<th>Preregulation</th>
<th>Postregulation</th>
<th>Preregulation</th>
<th>Postregulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase Positive</td>
<td>57.79 (19.79)</td>
<td>57.48 (19.9)</td>
<td>58.55 (20.06)</td>
<td>66.58 (18.59)</td>
</tr>
<tr>
<td>Decrease Negative</td>
<td>48.49 (18.32)</td>
<td>51.11 (21.74)</td>
<td>49.28 (20.82)</td>
<td>61.65 (20.76)</td>
</tr>
</tbody>
</table>

---

Table 9

Correlations Between the State-Reappraisal Inventory (SRI) and Self-Report Questionnaires (Study 4)

<table>
<thead>
<tr>
<th>Measures</th>
<th>SRI–Increase Positive</th>
<th>SRI–Decrease Negative</th>
<th>SRI–total score</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI</td>
<td>−.33**</td>
<td>−.16</td>
<td>−.27**</td>
</tr>
<tr>
<td>ERQ–Reappraisal</td>
<td>.37**</td>
<td>.31**</td>
<td>.36**</td>
</tr>
<tr>
<td>ERQ–Suppression</td>
<td>−.28**</td>
<td>−.18</td>
<td>−.24*</td>
</tr>
<tr>
<td>RRS–Rumination</td>
<td>−.41**</td>
<td>−.27**</td>
<td>−.36**</td>
</tr>
<tr>
<td>PSWQ–Worry</td>
<td>−.13</td>
<td>−.1</td>
<td>−.12</td>
</tr>
</tbody>
</table>

Note. BDI = Beck Depression Inventory; ERQ = Emotion Regulation Questionnaire; RRS = Ruminative Response Scale; PSWQ = Penn State Worry Questionnaire.

*p < .05. **p < .01.

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6 A negative correlation between the SRI and depression was found only in our Hebrew CFA and not in the English CFA. This inconsistency can possibly be explained by a Type II error in our English CFA. Although we did not find significant correlations between depression and the SRI (subscales, total score), these correlations were not significantly different from correlations of the SRI with other subscales of the DASS. For example, the difference between the correlation between SRI total score and anxiety (r = −.15) was not significantly different from the correlation between the SRI total score and depression (Steiger’s Z = −1.05, p = .85, 95% CI [−.26, .08]).
may also enable researchers to make more specific predictions with regards to individual differences in reappraisal efficacy (e.g., age, cognitive ability), and examine cases in which perceived reappraisal efficacy is biased (i.e., different from actual ability). Finally, the SRI may facilitate more training and treatment studies using mediational analyses and longitudinal multilevel modeling to examine state-reappraisal as a mechanism of change.

The SRI was built in such a way so that it can be used in relation to regulation of a specific negative event, but it could easily be adapted to fit other mood inductions or emotional situations (e.g., watching affective pictures or movie clips). Moreover, the SRI can be administered with (instructed) or without (spontaneous) explicit instructions to reappraise. Thus, the SRI could potentially be used in a variety of research designs to further validate it as well as to examine mechanisms of reappraisal.

**Limitations and Future Directions**

The SRI is unique in that it is specific to state-reappraisal and thus it may be extremely useful in studies looking into reappraisal specifically, and less useful in studies examining spontaneous regulation in general, or exploring the relationships between various ER strategies in a given moment (cf. Kivity & Huppert, 2016). Such studies should use a more general state-ER measure (e.g., Katz et al., 2017) or apply the SRI in conjunction with other state measures (e.g., State Hope Scale, Snyder, et al., 1996; State Mindfulness Scale, Tanay & Bernstein, 2013; The Brief State Rumination Inventory, Marchetti et al., 2018).

The SRI is also best suited to measure construal of an emotion-eliciting event as less negative or as more positive. However, there are potentially more ways that an event can be reappraised. For instance, the circumplex model of emotion (Posner, Russell, & Peterson, 2005) specifies two dimensions, valence (unpleasant–pleasant) and arousal (activated–deactivated). The reduced version of the PANAS used in Study 4 only includes low arousing, negative emotions (e.g., sad, despondent, depressed). Thus, it remains unclear whether the SRI is sensitive to changes in state reappraisal of an emotion-eliciting event as less arousing.

Somewhat related to the above issue, it should be noted that the Less Negative subscale of the SRI includes items that pertain to both the negativity of the emotion-eliciting event and its impact. Thus, it is possible that this subscale taps not only into reappraisal of events as less negative but also as less arousing or meaningful. Future studies should examine the suitability of the SRI for assessing arousal and perhaps other relevant dimensions on which a situation can be reappraised.

Of note, in the first two studies, the SRI was administered in English, whereas in the last two studies the SRI was administered in Hebrew. However, the questionnaire structure and psychometrics were consistent across studies. Regardless of methodological diversity, our findings were consistent, and this attests to the robustness of the SRI. Nonetheless, future studies are needed to examine the sensitivity of the English version and other translations of the SRI to various inductions in the laboratory and in the real world.

Despite these limitations, we believe that the SRI may be extremely useful in a range of study designs, in that it can be administered to measure spontaneous or instructed reappraisal following a variety of mood inductions. One interesting direction to pursue in future research would be to evaluate the psychometric properties of the SRI in the context of ecological momentary assessment, and apply multilevel factor analyses to tease apart within and between influences to its factor structure.

In sum, the current studies provide preliminary evidence for the adequacy of the SRI as a state measure of reappraisal. The SRI holds potential to deepen our understanding of contextual moderators of state-trait associations, acquisition or improvement of reappraisal ability, individual difference in reappraisal efficacy and biased perception of reappraisal self-efficacy, changes throughout training or treatment, and differences between Increase Positive reappraisal and Decrease Negative reappraisal.

**References**


