



Psychometric properties of the Swedish version of the Ego Resilience scale (ER) and a new shortened version of the Ego Undercontrol Scale (EUC)

Martina Isaksson¹ · Ata Ghaderi² · Martina Wolf-Arehult¹ · Mia Ramklint¹

Published online: 30 November 2018

© The Author(s) 2018

Abstract

The Ego Resilience scale (ER) and The Ego Undercontrol scale (EUC) are designed to assess personality types based on how people inhibit or express their emotional impulses. The study aim was to evaluate the psychometric properties of the Swedish version of both scales. Two community samples were recruited through convenience sampling and were informed about the study either while attending an undergraduate class at University or through advertisement on the Internet. For the two samples respectively, 483 and 197 individuals aged 18–70 completed the self-rating questionnaires via a website. In the first sample, factor structure, internal consistency, test-retest reliability and construct validity of the ER and the EUC were evaluated and a shorter version of the EUC (EUC-13) was developed based on the outcome. In the second sample, factor structure and psychometric properties of the EUC-13 were analyzed. Exploratory and confirmatory factor analysis supported both the original version of the ER and the EUC-13. Both instruments showed satisfactory levels of internal consistency for all subscales but Socially restrained behavior from the EUC-13, good test-retest reliability, as well as satisfactory preliminary evidence of validity. Further validation studies are recommended, such as investigating the scales in clinical settings.

Keywords Undercontrol · Overcontrol · Resilience · Personality · Validity · Reliability

During the last 25 years, three replicable personality types have been identified: resilient, overcontrolled, and undercontrolled, also called the ROU-types (Alessandri et al. 2013; Donnellan and Robins 2010). These types have recurrently been identified as predictors of different physical and mental health problems (Asendorpf et al. 2008; Chapman and Goldberg 2011; Lynch et al. 2015a). However, the field of research measuring over and undercontrol is small, and there is no gold standard for the assessment.

There are several different ways of describing and assessing personality. The most common is the attribute-centered perspective in the *five-factor model*, where personality is divided into five different traits: Openness, Conscientiousness, Extraversion, Agreeableness and

Neuroticism (Costa and McCrae 1997). Another approach is the person-centered perspective in which individuals are grouped based on how traits cluster in individuals, like the ROU-types (Asendorpf and van Aken 1999; Donnellan and Robins 2010; Letzring et al. 2005). It has been argued that the person-centered perspective is an important complement to the more common attribute-centered perspective in current personality research. As an example, the person-centered approach, like the ROU-types, is helpful for example when wanting to understand how constellations of attributes work together to affect different outcomes and responses of the individual (Donnellan and Robins 2010).

The ROU-types have been identified in several different cultures and contexts (Alessandri et al. 2013; Robins et al. 1996). Resilient individuals are described as able to handle acute stress, uncertainty or conflicts in an adaptive and flexible manner, which leads to better psychological adjustment than for individuals with low levels of resilience (Alessandri et al. 2013; Letzring et al. 2005). The overcontrolled individuals are able to constrain impulses and delay gratification, manifest needs indirectly and show minimal emotional expression. The undercontrolled individuals have limited ability to constrain impulses or delay gratification and display immediate and

✉ Martina Isaksson
martina.isaksson@neuro.uu.se

¹ Department of Neuroscience, Psychiatry, Uppsala University, Akademiska sjukhuset, 751 85 Uppsala, Sweden

² Division of Psychology, Department of Clinical Neuroscience, Karolinska Institutet, SE-171 77 Stockholm, Sweden

direct expression of feelings (Block and Block 1980; Letzring et al. 2005; Lynch et al. 2015b). In contrast to research often describing high levels of control as unilaterally positive (Tangney et al. 2004; Wills et al. 2016), both over and undercontrol are described as containing favorable *and* unfavorable characteristics in the theory of the ROU-types, and excessive variants of both can be dysfunctional (Block and Block 1980; Letzring et al. 2005; Lynch et al. 2015b).

The Ego Resilience scale (ER) and the Ego Undercontrol scale (EUC) are two self-report questionnaires designed to measure these constructs (Block and Block 1980). The scales have previously been validated together and can be used both separately and in combination. The ER scale was created to measure the ability to adapt one's level of control up or down based on the circumstances. It has shown an acceptable internal consistency and positive associations with several measures of well-being and negative associations with psychopathology (Block and Kremen 1996; Letzring et al. 2005). The EUC was created to identify the spectrum of individuals from overcontrolled to undercontrolled with one single scale (Block and Block 1980; Letzring et al. 2005). However, internal consistency has not been satisfactory. Factor analysis for both the ER and the EUC was performed in one study and reported to measure one single factor respectively. Factors were based on measures of internal consistency and scree plot from the factor analyses (Letzring et al. 2005). However, the scree plot or factor loadings were not presented and further investigation of both the ER and the EUC properties seems warranted.

Other self-report questionnaires for assessing the ROU-types have not been found. Measures targeting some aspects of the phenomena are, however, available. Emotion Control Questionnaire (ECQ2) (Roger and Najarian 1989) is a scale measuring emotional control in four different subscales related to overcontrol: Rehearsal, Emotion inhibition, Aggression control, and Benign control. The scale has shown satisfactory psychometric properties and can be used to validate the overcontrol spectrum of the EUC (Roger and Najarian 1989). It was translated in this study and analyzed in terms of reliability. A scale appropriate for assessing personality is the Swedish universities Scale of Personality (SSP) (Gustavsson et al. 2000). The scale is a well validated and in Sweden recurrently used personality assessment questionnaire designed to identify different personality constructs derived from existing neurobiological personality theories (Gustavsson et al. 2000). Three composite scales have been identified through factor analysis: The Extraversion, the Neuroticism and the Aggressiveness factors. The composite scales can be related to the ROU-types based on validation towards the five-factor model of personality (Aluoja et al. 2009) and is therefore used as a reference scale for validating the ER and the EUC.

In sum, both the ER and the EUC could be of use in research as well as clinical practice to investigate personality, emotion regulation or self-control among patients where these

difficulties appear, for example, in anorexia nervosa, obsessive-compulsive disorder, or borderline personality disorder (Carpenter and Trull 2013; Chapman et al. 2007; Lynch et al. 2015a). The scales are, however, in need of additional evaluation. Also, there are no Swedish versions of these scales or other appropriate instruments for measuring the concepts of overcontrol, undercontrol and resilience. Thus, the ER and the EUC were translated to Swedish in this study and their psychometric properties were investigated.

The aim of the study was to investigate the factor structure, reliability and validity of the ER and the EUC in a Swedish non-clinical population. We hypothesized that both scales would show factor structures indicating one single scale respectively. We also hypothesized that the ER and the EUC would show acceptable to high internal consistency and test-retest reliability, and at least acceptable convergent and divergent validity when compared to other instruments measuring similar concepts. Hence, for the ER we hypothesized a negative correlation with the SSP Neuroticism scale, a positive correlation with the SSP Extraversion scale and no or small correlation with the EUC scale. For the EUC we hypothesized negative correlations with all four overcontrol subscales from ECQ2, no or small correlations with the SSP Neuroticism and the ER scales, and positive correlations with the SSP Extraversion and Aggressiveness scales. For convergence, correlations on at least moderate levels were expected.

Materials and Methods

Procedure

The evaluation was performed in two separate non-clinical community samples. In the first sample, we performed factor analysis and psychometric evaluation of the ER and the EUC. The initial factor analysis of the EUC indicated that the scale was in need of item reduction, calling for a new evaluation. In the second sample, we performed a psychometric evaluation of the shorter version of the EUC (EUC-13). The first sample was recruited through convenience sampling from October 2014 to July 2016 in one of two different ways. First, students at Uppsala University from a large variety of courses were informed about the study through verbal and written information during class. Interested students received an email with a link to a website containing several questionnaires which were included for analyzing validity in our study. Two weeks after receiving the first questionnaires, participants received a new email and were offered to fill in the questionnaires a second time for assessing test-retest reliability. Secondly, people were recruited by advertisement in social media, on the homepage for the Department of Neuroscience and on a website developed for people who are interested in participating in scientific research (<http://www.studentkaninen.se>). Those who

volunteered received more information about the study and a link to the questionnaires via the Internet. Informed consent was obtained by ticking a box on the website after receiving information. All questions were mandatory except for gender. The second sample was recruited from August to September 2017 through the same web-based approach as in the first sample. Participants from both samples were offered to receive two lottery tickets, one movie ticket or to donate the corresponding amount of money to one of five different charity organizations.

Participants

There were 483 individuals in the first sample and 197 individuals in the second one. Inclusion criterion was being at least 18 years old. A flow-chart of the recruitment is presented in Fig. 1 and demographic characteristics are presented in Table 1.

Instruments

Ego Resilience, Ego Undercontrol and Ego Undercontrol - 13 (ER, EUC, EUC-13)

The ER-scale scale is a 14-item self-report questionnaire designed by Block and Block (1980). It aims to measure the ability to adapt the level of control based on the circumstances (Letzring et al. 2005). Factor analysis has resulted in a single factor, and the scale has shown satisfactory internal consistency (.72–.76) and construct validity (Block and Kremen 1996; Letzring et al. 2005). The EUC is a 37-item self-report questionnaire designed by Block and Block (1980). The scale aims to measure the spectrum from overcontrol to undercontrol with one single scale. Factor analysis has resulted in a single factor, internal consistency has however not been satisfactory (.63) (Letzring et al. 2005). Participants are asked to respond to items

Table 1 Demographic characteristics of included participants

	Sample 1 (<i>n</i> = 483)	Sample 2 (<i>n</i> = 197)
Mean age (<i>SD</i>)	30.6 (10.60)	32.1 (10.9)
Range (age)	18–70	18–64
Female	371 ^a (77%)	156 (79.2%)
Male	111 ^a (23%)	41 (20.8%)
Marital status		
Married or in a relationship	297 (61.5%)	117 (59.4%)
Single	158 (32.7%)	66 (33.5%)
Single parent	16 (3.3%)	9 (4.6%)
Other (e.g. living with parents)	12 (2.5%)	5 (2.5%)
Highest level of education		
Elementary school	18 (3.7%)	3 (1.5%)
High school	148 (30.6%)	42 (21.3%)
University	268 (55.5%)	139 (70.6%)
Other (e.g. advanced vocational education or folk high school)	49 (10.1%)	13 (6.6%)
Main activity		
Paid work (employee or own business)	209 (43.3%)	92 (46.7%)
Student	199 (41.2%)	83 (42.1%)
Unemployed	20 (4.1%)	7 (3.6%)
Sick leave	23 (4.8%)	7 (3.6%)
Other (e.g. parental leave or pension)	32 (6.6%)	8 (4.1%)

^a One participant did not report gender

on both the ER and the EUC on a four-point Likert scale ranging from “Disagree very strongly” (1) to “Agree very strongly” (4). High scores on the ER indicate high adaptive control. High scores on the EUC indicate high undercontrol, and low scores on the EUC indicate high overcontrol. The EUC-13 is a 13-item adaptation of the EUC, developed by the authors of this article. The scale was translated to Swedish and developed based on factor analysis from the two Swedish samples in the present article. The scale has three subscales: Uninhibited behavior,

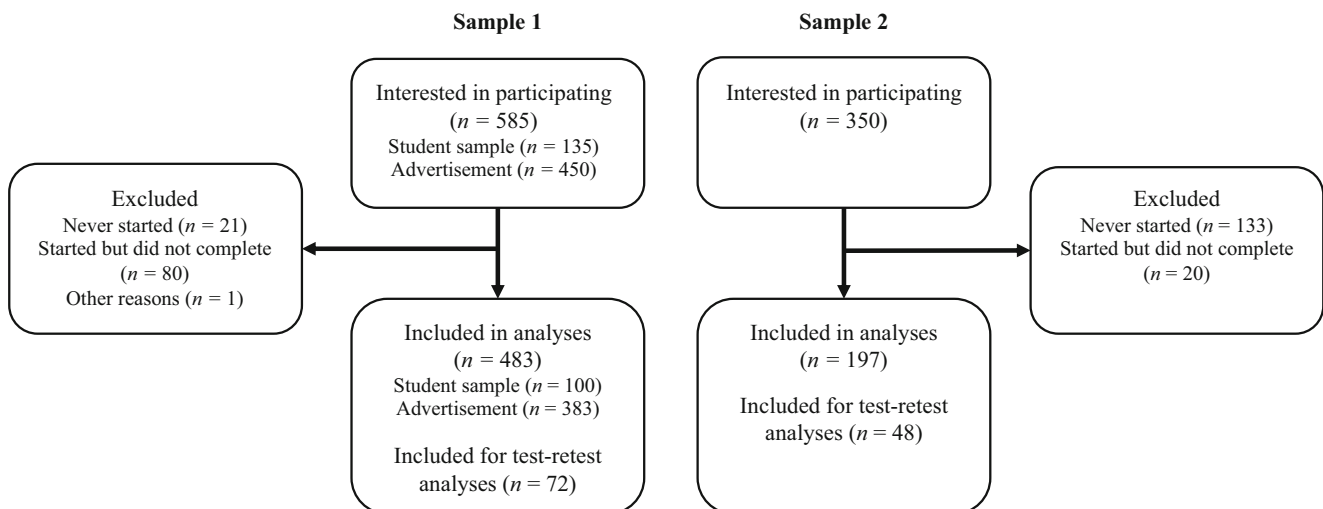


Fig. 1 Flow-chart of participant recruitment

Planful conscientious behavior (reversed) and Socially restrained behavior (reversed). The main purpose of the scale, direction, and scaling are the same as the original scale described above. The final score is obtained by reversing item 6–13 and calculate the mean for each scale. Psychometric properties are presented in the result section of this paper.

Emotion Control Questionnaire (ECQ2)

The ECQ2 is 56-item self-report questionnaire (Roger and Najarian 1989) designed to measure the tendency to inhibit expression of emotional responses in four different factors: 1) Rehearsal - the tendency to ruminate about emotional upsets, 2) Emotional inhibition - the tendency to inhibit emotional experience, 3) Aggression control - impulsivity with an aggressive component and 4) Benign control - impulsivity without an aggressive component (Roger et al. 2011; Roger and Najarian 1989). The scale has shown an acceptable to high internal consistency (.77–.86) and test-retest reliability (.73–.92) (Roger and Najarian 1989). Items are answered with a dichotomous true or false response choice. High scores on any of the subscales indicate high emotion control. Internal consistency of the ECQ2 in the present study was acceptable to high for the subscales Rehearsal, Emotion inhibition and Aggressive control (.80, .74, and .71), but less than satisfactory for Benign control (.65). Test-retest reliability was high with .80, .90, .80 and .84 for each subscale respectively.

Swedish Universities Scale of Personality (SSP)

The SSP is a 91-item self-report personality questionnaire developed by Gustavsson and colleagues (Gustavsson et al. 2000). The scale contains 13 subscales divided into three overarching factors: 1) the Neuroticism factor, containing the subscales Somatic trait anxiety, Psychic trait anxiety, Stress susceptibility, Lack of assertiveness, and Embitterment, 2) the Aggressiveness factor, containing the subscales Social desirability (reversed), Trait irritability, Verbal trait aggression, and Physical trait aggression, and 3) the Extraversion factor, containing the subscales Impulsiveness, Adventure seeking, and Detachment (reversed). Internal consistency has varied between .59 and .84 for all subscales (Gustavsson et al. 2000). The SSP has shown good concurrent validity in relation to the five-factor model of personality (Aluoja et al. 2009). Answers are reported on a four-point Likert scale ranging from “Does not apply at all” (1) to “Applies completely” (4). High scores on any of the subscales indicate strong features of each respective personality construct (Gustavsson et al. 2000).

Translation

The authors of the ER, the EUC and the ECQ2 approved translation to Swedish. A team of three native Swedish-speaking individuals with good knowledge in the English language translated the ER, the EUC and the ECQ2 from English

to Swedish. An independent bilingual translator, native in English and with fluent knowledge in Swedish, translated them back to English. The back-translated version was compared to the original version. Differences were discussed by the authors until consensus was achieved.

Statistical Analysis

The web-based format required a response to all the questions; hence, there were no missing values. The scales were normally distributed and showed only minor skewness and kurtosis, therefore, parametric tests were used. T-tests and Pearson's product-moment correlation coefficient (r) were conducted for analyzing potential age and gender differences on the scales. To assess factor structure, we used Principal Component Analysis (PCA) with varimax rotation. Confirmatory factor analysis (CFA) was conducted to validate the new factor structure. The robust maximum likelihood was chosen and we used several recommended fit indexes to determine how well our model fit the data: The chi-square (χ^2), the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), the Tucker-Lewis Index (TLI), and the comparative fit index (CFI). Acceptable fit is indicated by RMSEA below .08 with the lower boundary of the confidence interval below .05 and the upper boundary below 1.0, SRMR below .08, and TLI and CFI above .90. (Hu and Bentler 1999; Schermelleh-Engel et al. 2003). Good fit is indicated by a non-significant chi-square value, RMSEA below .05 and TLI and CFI close to .95. However, the chi-square is very sensitive to sample size, and the ratio χ^2/df has been recommended as a better approximation of model fit. An χ^2/df value below 3 or 2 is indicative of acceptable and good fit respectively (Schermelleh-Engel et al. 2003). Internal consistency was calculated with Cronbach's alpha (α). Test-retest reliability, convergent and divergent validity were calculated with Pearson's r (r) and p -values (p). Strength of the relationships between variables were evaluated based on Cohen's criteria, where effect sizes (r) were interpreted as follows: small $\geq .10$, medium $\geq .30$, large $\geq .50$ (Cohen 2013). Analyses were performed using IBM SPSS Statistics version 25 and R version 3.5.1.

Results

Relation to Age and Gender

Analyses showed only small correlations (r) between age and the ER $r(481) = -.09$, $p = .059$, the EUC $r(481) = -.18$, $p < .001$ and the EUC-13 $r(195) = -.06$, $p = .380$. Also, results for women and men were similar. ER mean (SD) were 2.54 (0.52) for women and 2.65 (0.52) for men, $t(481) = -1.91$, $p = .06$, $d = .21$; EUC mean (SD) were 2.28 (0.38) for women and 2.29 (0.33) for men, $t(481) = -0.20$, $p = .84$, $d = .03$; and

EUC-13 mean (*SD*) were 2.36 (0.44) for women and 2.26 (0.38) for men, $t(195) = 1.26, p = .21, d = .23$. Therefore, neither age nor gender were treated as factors in the analyses.

Factor Structure

In the first sample, a PCA was conducted for the ER. The Kaiser-Meyer-Olkin (KMO) was .88, above the commonly recommended value of .6 (Field 2013) and, hence, verified sampling adequacy for the analysis. Bartlett's test of sphericity $\chi^2(91, n = 483) = 1719.8, p < .001$ indicated that correlations between items were sufficiently large for PCA. Factor loadings of the ER are presented in Table 2. Both scree-plot and parallel analysis confirmed prior research indicating that the scale is best explained by a single component.

A PCA was also conducted for all original items of the EUC. The Kaiser-Meyer-Olkin measure of sampling adequacy was .88 and Bartlett's test of sphericity was significant $\chi^2(666, n = 483) = 5737.5, p < .001$. Factor structure of the Swedish version of the EUC contradicted prior research, with scree-plot and parallel analyses indicating three or five factors to be more adequate than one. By removing items with weak loadings and items loading on several components, in addition to theoretically discussing item reduction among the authors, a three-component model with 13 items appeared to be the most adequate solution. The remaining items clustered in the following components: 1) Uninhibited behavior 2) Planful conscientious behavior, and 3) Socially restrained behavior.

The new version was administered to a second sample and analyzed with CFA to validate the previously identified factor structure. Based on theoretical assumption, intercorrelations were added between the latent variables. Fit indexes suggested an acceptable fit between the model (Fig. 2) and the data: $\chi^2(62, n = 197) = 106.936, p < .05, \chi^2/df = 1.72, RMSEA = .063$

(90% CI: .042–.082), SRMR = .072, CFI = .914, and TLI = .891. All items but 11 showed loadings above .40.

Reliability

All reliability measures are presented in Table 3. All scales showed at least satisfactory internal consistency and test-retest reliability except for the subscale Socially restrained behavior showing less than satisfactory internal consistency.

Validity

For the ER, convergence was supported through strong positive correlations with SSP Extraversion in both samples $r(195) = .55, p < .001$ and $r(481) = .55, p < .001$, and through moderate negative correlations with SSP Neuroticism in sample 2 $r(195) = -.49, p < .001$. In sample 1, the correlation with SSP Neuroticism was also negative, yet small $r(195) = -.25, p < .001$. Divergence was supported through a small correlation with the EUC-13 (see Table 4). Correlations were significant at the family-wise Bonferroni adjusted alpha level.

Validity results for the EUC-13 can be found in Table 4. The EUC-13 Uninhibited behavior subscale indicated convergence through moderate to strong correlations with the SSP Extraversion and Aggressiveness scales, and with the Benign and Aggression control scales from the ECQ2. The EUC-13 Planful conscientious behavior was supported by moderate to strong negative correlations with the SSP Extraversion and the ECQ2 Benign control scales. Divergence for these scales were supported through no or small correlations with the SSP Neuroticism and the ER scales. Convergence for the EUC-13 Socially restrained subscale was indicated by moderate correlations with the ECQ2 Emotion inhibition and the SSP Extraversion scales. Divergence was, however, not supported

Table 2 Principal component analysis of the Ego Resilience scale

Item	Component 1
1. I am generous with my friends.	.45
2. I quickly get over and recover from being startled.	.56
3. I enjoy dealing with new and unusual situations.	.70
4. I usually succeed in making a favorable impression on people.	.63
5. I enjoy trying new foods I have never tasted before.	.60
6. I am regarded as a very energetic person.	.69
7. I like to take different paths to familiar places.	.62
8. I am more curious than most people.	.64
9. Most of the people I meet are likeable.	.56
10. I usually think carefully about something before acting.	.18
11. I like to do new and different things.	.69
12. My daily life is full of things that keep me interested.	.57
13. I would be willing to describe myself as a pretty “strong” personality.	.57
14. I get over my anger at someone reasonably quickly.	.44

Items loadings above 0.40 are marked in **boldface**.

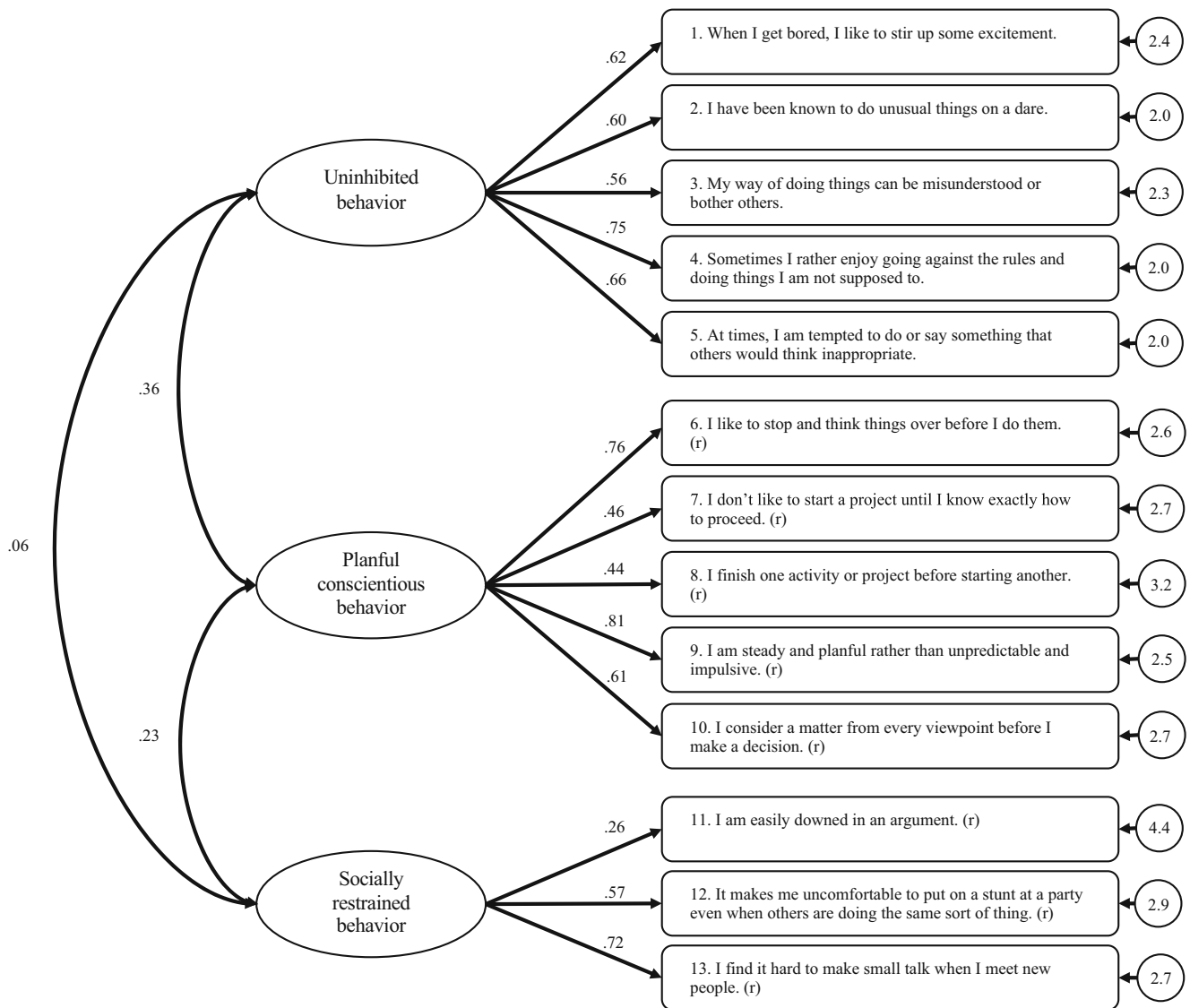


Fig. 2 Confirmatory factor analytic model of the Ego Undercontrol -13. Ellipses represent factors, rectangles represent items, circles represent error terms. Factor loadings are presented to the left of the items, covariance between factors are presented to the left of the factors.

Model fit: $\chi^2(62, n = 197) = 106.936, p < .05, \chi^2/df = 1.72, RMSEA = .063$ (90% CI: .042–.082), SRMR = .072, CFI = .914, and TLI = .891. r = reversed score

Table 3 Internal consistency and test-retest measurements of the Ego Resilience and the Ego Undercontrol - 13 scales

	α	$r(p)$	Mean (SD) 1	Mean (SD) 2
Sample 1	$n = 483$	$n = 72$	$n = 483$	$n = 72$
ER	.84	.85* (.001)	2.56 (0.52)	2.70 (0.44)
Sample 2	$n = 197$	$n = 48$	$n = 197$	$n = 48$
EUC-13 global score	.71	.86* (.001)	2.37 (0.43)	2.28 (0.45)
EUC-13 Uninhibited behavior	.76	.80* (.001)	1.83 (0.62)	1.97 (0.53)
EUC-13 Planful conscientious behavior	.76	.84* (.001)	2.44 (0.64)	2.29 (0.61)
EUC-13 Socially restrained behavior	.51	.75* (.001)	3.00 (0.68)	2.80 (0.74)

Internal consistency was performed with Cronbach's alpha (α), Test-retest was performed with Person product moment correlation (r) and p -values (p). *correlation is significant at the .01 level (2-tailed).

Table 4 Correlations and *p*-values between the EUC-13, the ER, the ECQ2 and the SSP

	EUC-13 Global score	EUC-13 Uninhibited behavior	EUC-13 Planful conscientious behavior	EUC-13 Socially restrained behavior
ECQ2				
Rehearsal	.00 (.977)	.15 (.036)	.02 (.753)	.19 (.009)
Emotion inhibition	-.38* (.001)	-.15 (.037)	.24* (.001)	.43* (.001)
Aggression control	-.38* (.001)	-.30* (.001)	.11 (.140)	.29* (.001)
Benign control	-.53* (.001)	-.50* (.001)	.39* (.001)	.05 (.491)
SSP				
Neuroticism scale	-.04 (.621)	.21* (.003)	.02 (.803)	.39* (.001)
Aggressiveness scale	.26* (.001)	.39* (.001)	-.06 (.430)	.02 (.748)
Extraversion scale	.69* (.001)	.44* (.001)	-.50* (.001)	-.41* (.001)
ER				
	.29* (.001)	.20* (.005)	-.08 (.275)	-.36* (.001)

Performed with Person product moment correlations (*r*) and *p*-values (*p*). *Correlation is significant at the family-wise Bonferroni adjusted alpha level (α) for the EUC-13 comparisons with the ECQ2 (.05/4 = .013), with the SSP (.05/3 = .017), and with the ER (.05/1 = .05) (2-tailed). **Boldface** shows correlations equal to or greater than .30, indicating at least moderate correlations.

EUC, Ego Undercontrol scale; *ER*, Ego Resilience scale; *ECQ2*, Emotion Control Questionnaire 2; *SSP*, Swedish universities Scale of Personality

because of moderate correlations with the SSP Neuroticism and the ER scales. The EUC-13 global score indicated convergence through moderate to strong correlations with three of the ECQ2 emotion control subscales and the SSP Extraversion factor, and divergence through no or small correlations with the SSP neuroticism and the ER scales.

Discussion

The main aim of this article was to evaluate the factor structure, the validity and the reliability of the ER and the EUC scales in their Swedish versions. The factor analysis of the ER confirmed prior research, showing the scale is best described as reflecting a single factor. The scale was highly reliable, with good internal consistency as well as test-retest reliability. In addition, convergent validity was satisfactory. For the EUC, many items were removed based on the initial analysis, yielding both higher explained variance and more robust factor loadings. The EUC-13 showed acceptable to good internal consistency for all subscales but one, as well as adequate test-retest reliability and construct validity.

Resilience has previously been associated with psychological well-being (Alessandri et al. 2013; Letzring et al. 2005). Using the ER as a measurement of resilience was supported through factor analysis and several measures of construct validity in our study. The ER was negatively associated with neuroticism in both samples supporting our prior hypotheses. However, the correlation was small in sample 1, calling for further replications. In both samples, the ER correlated with the Extraversion scale, also supporting prior validity research of the ER (Letzring et al. 2005). The ER also showed only a small correlation with the EUC-13 global score, supporting the theory that neither excessive overcontrol nor excessive undercontrol is unilaterally

positive and representative of an adaptive level of control (Block and Block 1980; Letzring et al. 2005; Lynch et al. 2015a, b). In summary, the ER scale shows preliminary evidence of satisfactory factor structure, reliability and validity.

Letzring et al. (2005) found that undercontrol measured by the EUC was positively related to personality traits like extraversion and openness and negatively related to agreeableness, while no or small correlations have been found with conscientiousness and neuroticism traits. These measures of validity were, however, hard to interpret since factor analysis was not satisfactory presented and the reliability of the scale was less than satisfactory. Thus, it was motivated to investigate whether the scale could be adapted to better fit the constructs of over and undercontrol. The shorter Swedish version of the EUC scale provided a three-factor model yielding both higher explained variance and more robust factor loadings than when testing with only one factor. The new model was supported when investigated in a new sample, indicated by an acceptable fit between our model and the data. Given the low loading of item 11 on Socially restrained behavior, the stability of this factor needs further investigation in future replications. This three-factor version somewhat opposes the original intention of constructing a scale that measures one single dimension. It is, however, reasonable to believe that the concept of over and undercontrol is complex, comprising several factors and, hence, supporting a multi-factorial solution. Nevertheless, the combination of factors may well provide adequate content validity to a single construct and individuals may vary along different factors. Still, the sum score (all factors together) may provide an overall pattern of general over or undercontrol. This idea is supported by Lynch et al. (2015a), who suggests that over and undercontrol are labels used to describe a complex set of behaviors, not just opposite ends of a one-

dimensional continuum. Using the sum of the whole scale can, therefore, be indicative of the general personality style.

The Uninhibited subscale from the EUC-13 showed acceptable to good reliability. Construct validity was supported by moderate to strong correlations with extraversion and aggressiveness, primarily covering aspects like impulsiveness, adventure seeking and social intimacy, as well as impulsive, verbal and physical aggressiveness. Validity was also supported by small correlations to neuroticism and resilience.

The EUC-13 Planful conscientious behavior subscale showed satisfactory to good reliability. Moderate to strong negative correlations with extraversion and impulsiveness as well as no or low correlation with measures of well-being like neuroticism and resilience supported validity. Both the Uninhibited and the Planful conscientious behavior subscale scale did, however, show only small correlations with constructs like rehearsal and emotion inhibition, not supporting our prior hypotheses. The reason for this can be explained by the fact that both the EUC-13 and its original version do not include items related to emotion inhibition or the tendency to ruminate about emotional upsets. Also, low correlations with the Rehearsal subscale can be explained by a hypothesis that both people with overcontrol and undercontrol engage in ruminating behavior (Roger and Najarian 1989; Selby et al. 2016). Also, the Planful conscientious behavior subscale showed no correlations with aggressiveness, covering aspects like irritability as well as impulsive, verbal and physical aggressiveness traits. This possibly indicates that aggressiveness is not primarily just a trait among the undercontrollers.

Reliability for the EUC-13 subscale Socially restrained behavior was not satisfactory. Validity was ambiguous, supported by moderate to high correlations with emotion inhibition and a strong negative correlation with extraversion, yet not supported by correlations to other measures of overcontrol like rehearsal, impulsiveness, and aggressiveness traits. In addition, the scale correlated positively with neuroticism and negatively with resilience, suggesting that there is a relation between social restraint and psychological problems, opposing divergent validity. Individuals high in social inhibition have, however, been shown to have an increased vulnerability for internalizing problems (de Moor et al. 2018), and it is possible that the social restraint items from the EUC-13 subscale are measuring an aspect of social inhibition related to these type of internalizing difficulties. Due to poor internal consistency as well as weak factor loading on item 11, using this subscale to assess socially restrained behavior cannot be recommended until further replications have been performed. The first two factors, however, are appropriate for assessing uninhibited and planful conscientious behavior, in addition to using them for the global score along with items from the Socially restrained subscale.

In EUC-13, the global score showed the most stable validity measures in our sample. This was primarily supported by

moderate to strong correlations to extraversion, different aspects of impulsiveness, emotion inhibition, as well as no or low correlation to neuroticism and resilience. All these factors taken together appear to be the best description of the constructs. Hence, using the sum of the whole scale is recommended for assessing personality style in terms of over and undercontrol.

Limitations

The study has some limitations to consider. First, there is no gold standard in the field for measuring over and undercontrol and the instruments used for validating the ER and the EUC-13 in this study provide, at best, good approximations. Secondly, the characteristics of the samples call for caution regarding whom the results can be generalized to. It is possible that people with difficulties in emotion regulation showed greater interest in the study and they probably are not representative of the general population. Thirdly, the study did not include a clinical sample, which excludes knowledge about the properties of the scales in clinical settings.

Conclusion

Reliability and validity measures of the ER as well as the EUC-13 are regarded as promising for measuring resilience, overcontrol and undercontrol. In general, the ER seems to be an adequate measure of resilience and the EUC-13 seems to correlate well with over and undercontrol characteristics like extraversion, adventure seeking, impulsiveness, and emotion inhibition. Also, reducing the EUC to 13 items reduces the patient burden and, hence, increases its clinical utility. The questionnaires can be valuable in studies of over and undercontrol, personality, self-regulation, and potential relation to psychiatric problems. Future research should focus on assessing the presence of these constructs in a clinical population.

Acknowledgments Data, analytic methods, and study material will not be publicly available due to confidentiality but can be made available upon reasonable request to the corresponding author. The research was not preregistered.

Funding We would like to thank Region Uppsala for financial support as salary to the first author.

Compliance with Ethical Standards The study was approved by the Regional Ethics committee in Uppsala (Dnr 2014/252). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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

Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

References

- Alessandri, G., Vecchione, M., Donnellan, B. M., Eisenberg, N., Caprara, G. V., & Cicciuch, J. (2013). On the cross-cultural replicability of the resilient, Undercontrolled, and Overcontrolled personality types. *Journal of Personality*, 82(4), 340–353. <https://doi.org/10.1111/jopy.12065>.
- Aluoja, A., Voogne, H., Maron, E., Gustavsson, J. P., Vöhma, U., & Shlik, J. (2009). Personality traits measured by the Swedish universities scales of personality: Factor structure and position within the five-factor model in an Estonian sample. *Nordic Journal of Psychiatry*, 63(3), 231–236. <https://doi.org/10.1080/08039480802571036>.
- Asendorpf, J. B., & van Aken, M. A. G. (1999). Resilient, overcontrolled, and undercontrolled personality prototypes in childhood: Replicability, predictive power, and the trait-type issue. *Journal of Personality and Social Psychology*, 77(4), 815–832. <https://doi.org/10.1037/0022-3514.77.4.815>.
- Asendorpf, J. B., Denissen, J. J. A., & van Aken, M. A. G. (2008). Inhibited and aggressive preschool children at 23 years of age: Personality and social transitions into adulthood. *Developmental Psychology*, 44(4), 997–1011. <https://doi.org/10.1037/0012-1649.44.4.997>.
- Block, J. H., & Block, J. (1980). The role of ego-control and ego-resiliency in the organization of behavior. In W. A. Collins (Ed.), *Development of cognition, affect, and social relations: The Minnesota symposia on child psychology* (Vol. 13, pp. 39–101). Hillsdale, NJ: Erlbaum.
- Block, J., & Kremen, A. M. (1996). IQ and ego-resiliency: Conceptual and empirical connections and separateness. *Journal of Personality and Social Psychology*, 70(2), 349–361. <https://doi.org/10.1037/0022-3514.70.2.349>.
- Carpenter, R. W., & Trull, T. J. (2013). Components of emotion dysregulation in borderline personality disorder: A review. *Current Psychiatry Reports*, 15(1), 335–343. <https://doi.org/10.1007/s11920-012-0335-2>.
- Chapman, B. P., & Goldberg, L. R. (2011). Replicability and 40-year predictive power of childhood ARC types. *Journal of Personality and Social Psychology*, 101(3), 593–606. <https://doi.org/10.1037/a0024289>.
- Chapman, A. L., Lynch, T. R., Rosenthal, M. Z., Cheavens, J. S., Smoski, M. J., & Krishnan, K. R. R. (2007). Risk aversion among depressed older adults with obsessive compulsive personality disorder. *Cognitive Therapy and Research*, 31(2), 161–174. <https://doi.org/10.1007/s10608-006-9114-x>.
- Cohen, J. (2013). Statistical power analysis for the behavioral sciences. *Routledge Academic*, 26, 588. <https://doi.org/10.2307/2529115>.
- Costa, P. T., & McCrae, R. R. (1997). Stability and change in personality assessment: The revised NEO personality inventory in the year 2000. *Journal of Personality Assessment*, 68, 86–94. https://doi.org/10.1207/s15327752jpa6801_7.
- Donnellan, M. B., & Robins, R. W. (2010). Resilient, Overcontrolled, and Undercontrolled personality types: Issues and controversies. *Social and Personality Psychology Compass*, 4(11), 1070–1083. <https://doi.org/10.1111/j.1751-9004.2010.00313.x>.
- Field, A. P. (2013). *Discovering statistics using IBM SPSS statistics* (4th ed.). London: SAGE.
- Gustavsson, J. P., Bergman, H., Edman, G., Ekselius, L., von Knorring, L., & Linder, J. (2000). Swedish universities scales of personality (SSP): Construction, internal consistency and normative data. *Acta Psychiatrica Scandinavica*, 102(3), 217–225. <https://doi.org/10.1034/j.1600-0447.2000.102003217.x>.
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>.
- Letzring, T. D., Block, J., & Funder, D. C. (2005). Ego-control and ego-resiliency: Generalization of self-report scales based on personality descriptions from acquaintances, clinicians, and the self. *Journal of Research in Personality*, 39(4), 395–422. <https://doi.org/10.1016/j.jrp.2004.06.003>.
- Lynch, T. R., Curtis, V., & Dunkley, C. (2015a). Radically open-dialectical behavior therapy for disorders of over-control: Signaling matters. *American Journal of Psychotherapy*, 69(2), 141–162.
- Lynch, T. R., Whalley, B., Hempel, R. J., Byford, S., Clarke, P., Clarke, S., Kingdon, D., O'Mahen, H., Russell, I. T., Shearer, J., Stanton, M., Swales, M., Watkins, A., & Remington, B. (2015b). Refractory depression: Mechanisms and evaluation of radically open dialectical behaviour therapy (RO-DBT) [REFRAMED]: Protocol for randomised trial. *BMJ Open*, 5(7), e008857–e008857. <https://doi.org/10.1136/bmjopen-2015-008857>.
- de Moor, E. L., Denollet, J., & Lacculle, O. M. (2018). Social inhibition, sense of belonging and vulnerability to internalizing problems. *Journal of Affective Disorders*, 225(June 2017), 207–213. doi: <https://doi.org/10.1016/j.jad.2017.08.034>.
- Robins, R. W., John, O. P., Caspi, A., Moffitt, T. E., & Stouthamer-Loeber, M. (1996). Resilient, overcontrolled, and undercontrolled boys: Three replicable personality types. *Journal of Personality and Social Psychology*, 70(1), 151–171. <https://doi.org/10.1037/0022-3514.70.1.157>.
- Roger, D., & Najarian, B. (1989). The construction and validation of a new scale for measuring emotion control. *Personality and Individual Differences*, 10(8), 845–853. [https://doi.org/10.1016/0191-8869\(89\)90020-2](https://doi.org/10.1016/0191-8869(89)90020-2).
- Roger, D., Scremin, L. G., Borril, J., & Forbes, A. (2011). Rumination, inhibition and stress: The construction of a new scale for assessing emotional style. *Current Psychology*, 30(3), 234–244. <https://doi.org/10.1007/s12144-011-9117-y>.
- Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, 8(2), 23–74. <https://doi.org/10.1002/0470010940>.
- Selby, E. A., Fehling, K. B., Panza, E. A., & Kranzler, A. (2016). Rumination, mindfulness, and borderline personality disorder symptoms. *Mindfulness*, 7(1), 228–235. <https://doi.org/10.1007/s12671-015-0432-5>.
- Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, 72(2), 271–324. <https://doi.org/10.1111/j.0022-3506.2004.00263.x>.
- Wills, T. A., Simons, J. S., Sussman, S., & Knight, R. (2016). Emotional self-control and dysregulation: A dual-process analysis of pathways to externalizing/internalizing symptomatology and positive well-being in younger adolescents. *Drug and Alcohol Dependence*, 163, 37–45. <https://doi.org/10.1016/j.drugalcdep.2015.08.039>.