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ADAPTATION AND VALIDATION OF THE BRIEF RESILIENCE SCALE (BRS) AND THE POSITIVE APPRAISAL STYLE (PAS) SCALE INTO ESTONIAN AND RUSSIAN ON A REPRESENTATIVE ESTONIAN SAMPLE

Master's thesis

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Abstract

Psychological resilience refers to the capacity to recover from stress. One proposed core mechanism enabling resilience is positive appraisal style – the tendency to view challenges constructively. Validated resilience measures for the Estonian population are currently lacking. This thesis reports the adaptation and validation of two instruments in Estonian and Russian: the 6-item Brief Resilience Scale (BRS) and the 8-item Positive Appraisal Style questionnaire (PAS8).

A rigorous translation and cultural adaptation process was conducted using the back-translation method. The instruments were tested on a nationally representative sample (n = 1256) as part of the first wave of the Estonian National Mental Health Survey in 2023. Exploratory factor analysis (n = 663) was used to develop PAS8's structure, identifying four theoretically grounded dimensions: optimism, coping efficacy, no-worries thinking, and silver-lining thinking.

Both the BRS and the PAS8 demonstrated good internal consistency (Cronbach's $\alpha > 0.8$) and strong model fit in confirmatory factor analysis. While measurement invariance testing supported structural equivalence across versions, comparability of mean scores (scalar invariance) was primarily achieved for the Estonian versions. Validity was supported by expected correlations (r = 0.4 - 0.5) with mental health indicators, stress-buffering effects, and unique variance beyond demographics.

In conclusion, both scales are psychometrically adequate and suitable for resilience monitoring in Estonia. Future work should assess test–retest reliability and review item wording effects of the Russian BRS.

Keywords: resilience, positive appraisal style, BRS, PAS8, adaptation, validation

Mõõdikute *Brief Resilience Scale* (*BRS*) ja *Positive Appraisal Style (PAS) Scale* adapteerimine eesti ja vene keelde ning valideerimine Eesti rahvastiku esinduslikul valimil

Lühikokkuvõte

Säilenõtkus (*psychological resilience*) viitab indiviidi võimele taastuda stressirohketest elusündmustest. Üheks keskseks säilenõtkust toetavaks mehhanismiks peetakse positiivset tõlgenduslaadi ehk suundumust käsitleda raskusi konstruktiivses valguses. Hetkel puuduvad säilenõtkuse hindamiseks valideeritud mõõtevahendid, mis sobiksid seireuuringuteks Eesti rahvastikul. Käesolev magistritöö kirjeldab kahe säilenõtkusega seotud küsimustiku – 6-väiteline säilenõtkuse lühiskaala (BRS) ja 8-väiteline positiivse tõlgendusstiili küsimustik (PAS8) – kohandamist ja valideerimist eesti- ja venekeelsele elanikkonnale.

Küsimustike kultuuriliseks kohandamiseks viidi läbi põhjalik tõlkeprotsess tagasitõlke meetodil. Mõõdikuid testiti Eesti rahvastiku esinduslikul valimil (n = 1256) osana Vaimse tervise seireuurngu esimesest lainest 2023. aastal. Eksploratiivse faktoranalüüsi tulemuste põhjal (n = 663) töötati välja PAS8 skaala, milles eristusid neli teoreetiliselt põhjendatud positiivse tõlgenduslaadi aspekti: optimism, usk toimetulekusse, halva alatähtsustamine, halvas hea nägemine.

Kinnitava faktoranalüüsi ja Cronbachi alfa ($\alpha > 0,8$) tulemuste alusel on mõlemad BRS ja PAS8 nii eesti kui vene keeles hea sisereliaablusega. Mõõtmise invariantsuse tulemused toetasid küsimustike struktuurilist võrreldavust, kuid keskmiste tulemuste võrreldavus (skaala-invariantsus) saavutati peamiselt eestikeelsete versioonide puhul. Valiidsust toetasid ootuspärased seosed vaimse tervise näitajatega (r = 0,4–0,5), stressi mõju leevendamine ning demograafilistest teguritest sõltumatu unikaalne variatiivsus.

Kokkuvõttes on mõlema küsimustiku mõlemad keele-versioonid psühhomeetriliselt usaldusväärsed ning sobivad säilenõtkuse hindamiseks Eestis. Edasiarendustes võiks hinnata skaalade kordustesti reliaablust ning vaadata üle venekeelse BRSi sõnastuse.

Märksõnad: säilenõtkus, positiivne tõlgenduslaad, BRS, PAS8, adapteerimine, valideerimine

Introduction

The importance of monitoring mental health and the underlying psychological processes that support adaptive functioning has grown significantly in response to increasing global stressors and societal disruptions, which have contributed to elevated levels of uncertainty, stress, and anxiety (Bögemann et al., 2023; Laidra et al., 2023; McBride et al., 2020). In response to these challenges, Estonia launched its first national mental health monitoring initiative, the Estonian National Mental Health Study (EMHS; *Eesti rahvastiku vaimse tervise uuring, RVTU*), conducted by the Estonian National Institute for Health Development (*Tervise Arengu Instituut*), which provided a comprehensive overview of the population's mental well-being. Based on the results, the Ministry of Social Affairs (*Sotsiaalministeerium*) initiated a long-term national mental health monitoring study to inform public policy and strengthen population-level mental health support. Psychological resilience was considered one relevant factor contributing to mental well-being and stress recovery to be included in the monitoring study, but no validated resilience measures were available for use with the Estonian population as of 2023.

The Concept of Resilience

Resilience is widely understood as a multidimensional and dynamic construct, reflecting an individual's capacity to adapt positively to adversity, navigate challenges, and recover from stress (American Psychological Association, 2018; Kalisch et al., 2019). However, for scientific clarity, it is useful to identify its conceptual core, and in its "purest" or most foundational form, resilience is best defined as the ability to bounce back or recover from stress (Smith et al., 2008).

While definitions of resilience may vary in scope, it consistently plays an important role in mental health and well-being, and has consequently attracted considerable attention in psychological research over the past two decades (Geller & Chien, 2014).

Historically, resilience research focused on individuals who thrived despite extreme adversity, such as trauma or chronic stress. The roots of resilience theory lie in early research on at-risk children who managed to flourish despite significant environmental adversity (Masten & Coatsworth, 1998; Tusaie & Dyer, 2004). Early work conceptualized these individuals as "invulnerable," implying a rare or innate quality (Dyer & McGuinness, 1996). Over time, this view shifted toward understanding resilience not as a fixed trait but as a

dynamic and modifiable process, shaped by a broad array of personal, social, and contextual resources that vary across time and circumstances (Chmitorz, Kunzler, et al., 2018; Kalisch et al., 2019). Since then, research has expanded to include diverse populations and life contexts, with growing attention to resilience as a capacity that can develop over time.

This conceptual evolution reflects a broader shift in psychology: from pathology-focused models toward strength-based frameworks that emphasize growth, flexibility, and emotion regulation in response to stressors (Kampa et al., 2018). Recent definitions have broadened to include psychological, physiological, and social domains, aligning with integrative models of mental health (Southwick et al., 2014). Network-based approaches have further advanced this understanding by modeling resilience as the result of dynamic interactions among protective factors at multiple levels (Kalisch et al., 2019). In line with this view, resilience is increasingly recognized as a form of psychological plasticity that can develop over time, through experience, learning, and targeted interventions (Joyce et al., 2018; Southwick & Charney, 2012). Neurobiological findings support this notion, showing adaptive changes in systems related to stress regulation, memory, and emotional processing among resilient individuals (Kampa et al., 2018; Russo et al., 2012).

Across these models, a consistent set of protective factors has been identified. These include supportive social relationships (Windle et al., 2011); effective coping strategies such as problem-solving, goal-setting, and emotion regulation (Gloria & Steinhardt, 2016); and positive cognitive styles like optimism and reappraisal (Gross et al., 2019; Tugade & Fredrickson, 2004). Although neurobiological and genetic components – such as HPA axis functioning or COMT polymorphisms – have been explored, their effects are typically modest and highly context-dependent (Askelund et al., 2019; Kalisch et al., 2017). Importantly, these protective factors are not isolated; they often interact and exert their influence differently depending on developmental stage, adversity type, and environmental context. Therefore, understanding the interplay between cognitive appraisals and external supports is essential for a comprehensive account of resilience processes.

Resilience and Appraisal Style

Positive appraisal style has emerged as a central cognitive mechanism of resilience, supported by both empirical findings and theoretical models (Kalisch et al., 2017). Grounded in appraisal theories of emotion, it refers to a person's general tendency to interpret stressors in an optimistic, manageable, and meaningful way – such as believing in one's coping ability,

minimizing perceived threat, and finding benefits in adversity. These processes have been shown to buffer the effects of stress, reduce negative emotional reactions, and enhance recovery following exposure to adversity (Gross et al., 2019; Webb et al., 2012; Zahniser & Conley, 2018).

This perspective is formalized in the Positive Appraisal Style Theory of Resilience (PASTOR; Kalisch et al., 2015), which serves as a key theoretical foundation for the present thesis. PASTOR defines resilience as a dynamic outcome driven by the habitual use of positive appraisals, rather than a fixed personality trait. According to this model, individuals who consistently interpret stressors in a constructive, non-catastrophic light are better able to regulate emotional responses and maintain mental health under pressure. By centering on appraisal tendencies as modifiable cognitive mechanisms, the theory provides a compelling basis for both empirical assessment and intervention.

Furthermore, experimental findings suggest that reappraisal training – which strengthens the flexible ability to reframe negative experiences – can improve both resilience and mental health outcomes (Liu et al., 2018; Wang et al., 2021). Since positive appraisal style represents the dispositional counterpart to reappraisal, shaping how individuals habitually interpret challenges (Gross, 2001; Uusberg et al., 2023), this conceptual link supports the use of appraisal-focused instruments in both research and clinical contexts.

While PASTOR is one of the most comprehensive and integrative frameworks currently available for understanding cognitive resilience mechanisms, it is not without limitations. Critics note the need for further empirical testing in diverse populations and settings, as well as for clearer differentiation between appraisal styles and broader emotion regulation constructs (Freund & Staudinger, 2015). Nevertheless, the theory's emphasis on modifiable cognitive processes makes it a valuable foundation for the present study, which seeks to operationalize and measure these mechanisms in the context of mental health monitoring.

Assessing Resilience: The Brief Resilience Scale (BRS)

The conceptual diversity surrounding resilience continues to pose challenges for its consistent definition and measurement. In a comprehensive review of 19 resilience measures, Windle et al. (2011) identified the Connor-Davidson Resilience Scale (CD-RISC; Campbell-Sills & Stein, 2007), the Resilience Scale (RS; Wagnild & Young, 1993) and the Brief Resilience Scale (BRS; Smith et al., 2008) as the most psychometrically robust instruments. Among

these, the BRS was noted for its brevity and conceptual clarity, offering a focused assessment of the core resilience construct: the ability to recover from stress**.** Unlike broader scales that encompass a wide range of traits and coping styles, the BRS is a unidimensional measure designed specifically to capture "bouncing back," making it especially suitable for large-scale population research.

The BRS consists of 6 items and has demonstrated strong internal consistency (with Cronbach's alpha ranging from 0.80-0.91 in four different samples; Smith et al., 2008) and construct validity across diverse populations. It shows meaningful correlations with related constructs – negatively with anxiety, depression, and negative affect, and positively with personal and interpersonal functioning – further supporting its validity as a measure of psychological resilience.

An important advantage of the BRS lies in its efficiency and accessibility. Its short format minimizes respondent burden, which is particularly important in studies with broad samples, such as national surveys. The BRS has also been widely translated and adapted to various cultural contexts. As of 2020, it had been translated into at least 13 languages (Smith, 2020) and psychometrically validated in numerous cultural contexts, including Spanish (Rodríguez-Rey et al., 2016), Chinese (Ching et al., 2020; Lai & Yue, 2014), German (Chmitorz, Wenzel, et al., 2018), Dutch (Soer et al., 2019), Turkish (Akyol & Özen, 2025; Doğan, 2015) and Greek (Kyriazos et al., 2018), supporting its cross-cultural applicability in global mental health research.

In summary, the BRS's concise format, strong psychometric properties, and focus on the core aspect of resilience make it an excellent tool for large-scale monitoring studies aiming to assess the ability of individuals to recover from stress.

Assessing Appraisal Style: The Positive Appraisal Style Scale (PASS)

The Positive Appraisal Style Theory of Resilience (PASTOR; Kalisch et al., 2015) posits that an individual's habitual tendency to appraise stressors positively – termed positive appraisal style (PAS) – plays a central role in fostering resilience and mental well-being. Recognizing the need for reliable instruments to measure this construct, Petri-Romão, Engen, et al. (2024) developed the Positive Appraisal Style Scale (PASS), comprising two complementary self-report questionnaires: the PASS-process and the PASS-content.

The PASS-process focuses on the cognitive strategies individuals employ to generate positive appraisals in stressful situations, such as positive reframing, acceptance, and distancing. This 10-item scale demonstrated good internal consistency ($\alpha = 0.78$) and construct validity across diverse samples (Petri-Romão et al., 2024). In contrast, the PASS-content assesses the outcomes of these cognitive processes, capturing the extent to which individuals perceive stressors as manageable, meaningful, or beneficial. This 14-item scale exhibited strong internal consistency ($\alpha = 0.87$) and robust convergent and discriminant validity (Petri-Romão et al., 2024).

While other measures, such as the Life Orientation Test-Revised (LOT-R; Scheier et al., 1994) for optimism and the General Self-Efficacy Scale (GSE; Schwarzer & Jerusalem, 1995), assess related constructs, they do not specifically target the appraisal processes central to PASTOR. The PASS addresses this gap providing a nuanced assessment of both the cognitive mechanisms and content of positive appraisals. Their development involved rigorous psychometric evaluations, including exploratory and confirmatory factor analyses in large, diverse samples, ensuring their suitability for both research and clinical applications (Petri-Romão et al., 2024).

Given the aim of large-scale, population-level monitoring, adapting the Content version of the PASS was considered appropriate, as it captures the construct of positive appraisal style with sufficient depth and practicality for this purpose.

In summary, the PASS was developed following the insight that resilience is not only a matter of recovery, but also involves how individuals cognitively appraise and interpret stressors. The PASS was specifically created to assess positive appraisal style – a cognitive disposition to interpret potentially stressful events in a positive or adaptive light.

Objectives and Research Questions

The primary objective of this thesis is to contribute to the development of reliable and valid tools for assessing psychological resilience in the Estonian context, taking into account the country's linguistic diversity. Two instruments – the 6-item Brief Resilience Scale (BRS) and the content version of the Positive Appraisal Style (PAS) Scale – were selected for their conceptual clarity, psychometric robustness, and complementary nature. Given the complexity of resilience as a construct, these instruments together suggest a focused and

complementary approach to capturing both the behavioral outcome of resilience and its cognitive antecedents.

This thesis addresses the following research aims:

1. Translation and Cultural Adaptation: To ensure that the translated questionnaires reflect conceptual and linguistic equivalence with the original English (BRS) and German/English (PASS) versions.
2. Internal Structure and Reliability: To evaluate the internal structure, factor validity, and reliability of the Estonian and Russian versions of the BRS and PASS.
    2.1. For internal consistency a specific hypothesis (**H1**) is proposed, that both scales will achieve high internal consistency ($\alpha > 0.80$) across both language groups.
3. Measurement Invariance: To examine whether the adapted instruments function similarly across different languages (Estonian vs. Russian) and administration formats (online survey vs. phone interview), including configural, metric invariance and to assess scalar invariance for the potential to support cross-group mean comparisons.
4. Construct Validity: To assess the convergent and divergent validity of the instruments using external mental health indicators. Specifically, to examine associations with well-being and life satisfaction, and symptoms of depression, anxiety, and asthenia and to test whether the scales moderate the relationship between stress and mental health outcomes.
    4.1. **H2**: BRS and PASS scores will correlate positively with well-being (items from Estonian National Mental Health Study [EMHS]; Laidra et al., 2023) and life satisfaction.
    4.2. **H3:** BRS and PASS scores will correlate negatively with depression, anxiety, and asthenia scores (Emotional State Questionnaire-2 [EST-Q2]; Aluoja et al., 1999).
    4.3. **H4:** BRS and PASS scores will moderate the relationship between stress and mental health outcomes (e.g., mitigating the negative impact of stress on well-being and depression).

The present thesis was conducted by the author as part of a collaborative project on mental health monitoring in Estonia. The author led and coordinated the translation and adaptation of the measurement instruments, took part in expert consultations, and was responsible for the psychometric analysis and preparation of the manuscript.

Method

Translation and Adaptation Process

The Brief Resilience Scale (BRS) and the Positive Appraisal Style Scale (PASS) were adapted into Estonian and Russian through a multistage translation and cultural adaptation process based on internationally recognized back-translation guidelines (e.g., Beaton et al., 2000; Lenz et al., 2017; Sousa & Rojjanasrirat, 2011).

Both questionnaires were translated from the original languages into both Estonian and Russian using the back-translation method. A total of 9 experienced experts participated in the translation and cultural adaptation process. For BRS, we used the English original, and for PASS, we used both German (original) and English (PASS preprint translation) versions. For all versions, the translation process consisted of six stages: (1) making two independent initial translations; (2) integrating the translations; (3) back-translation by translators not involved in previous discussions; (4) comparing back-translations with originals, and further adjusting translations; (5) obtaining feedback on translations from questionnaire testers, specialists and translators at Estonian Ministry of Social Affairs, and translator from *Turu-uuringute AS*; and (6) analysing feedback and creating final translations. Both questionnaires were tested by 6 volunteers who provided verbal feedback on the clarity of statements and their experience in filling in the questionnaires.

In the translation process, we also adjusted the response scales of both questionnaires. The 5-point scale of the English BRS [Strongly Disagree (1) – Disagree (2) – Neutral (3) – Agree (4) – Strongly Agree (5)] was initially translated as: *Ei nõustu üldse* (1) – *Ei nõustu* (2) – *Nii ja naa* (3) – *Nõustun* (4) – *Nõustun täielikult* (5). Based on the feedback from questionnaire testers, we assessed that the distance between response options from 1-to-2 and 4-to-5 was considerably smaller than between 2-3 and 3-4. Options 1 and 5 were also potentially underutilized. Therefore, we adopted the scale: *Ei nõustu* (1; Disagree) – *Pigem ei nõustu* (2; Rather disagree) – *Nii ja naa* (3; Maybe one or the other) – *Pigem nõustun* (4; Rather agree) – *Nõustun* (5; Agree).

For PASS, we decided to change both the number of scale points and the scale type. The original PASS has a 4-point frequency-labelled scale: Never (1) – Sometimes (2) – Often (3) – Almost always (4). Testing the questionnaires revealed that a scale with different length and content was an additional cognitive burden, which in a large-scale monitoring study

might increase risks of scale interpretation errors. Since PASS was in the preprint phase and newly developed at the time of adaptation, we decided to adopt the same scale as BRS.

Translation and adaptation of BRS and PASS were conducted with the written consent of the main authors Bruce Smith (BRS) and Papoula Petri-Romao and Raffael Kalisch (PASS), who supported the process by sharing additional materials. To the authors' knowledge, there were no previous Estonian or Russian translations of the questionnaires as of 2023.

Data Collection and Sample

Data was collected in March–April 2023 as a part of the first wave of nationally representative mental health monitoring survey (*Vaimse tervise seire*) commissioned by the Estonian Ministry of Social Affairs. The target population included all residents of Estonia aged 15 and older. Stratified random sampling was used based on gender, age, region, and ethnicity, drawing from the Estonian Population Register and Turu-uuringute AS web panel.

Participants ($N = 1256$) completed the survey either online ($n = 998$) or via telephone interview ($n = 258$). Respondents could choose to complete the survey in either Estonian or Russian. In the survey invitation sent to members of the web panel, the topic of the study was not disclosed (to reduce the bias of more appealing topic/survey selection for participation), but information was provided about the estimated duration of completing the questionnaire (approximately 15 minutes) and bonus points awarded for participation (panel members accumulate points by participating in surveys, which can be exchanged for gift cards or donated to charity once a certain amount is reached).

The telephone survey was conducted at the Turu-uuringute (TU) AS call center by professional interviewers. A total of 22 interviewers participated in the data collection. In total, 258 respondents were interviewed by phone and 998 filled the online survey (including 428 from the TU web panel and 570 from the Population Register sample). The response rate was 10% in the Population Register web sample, 19% in the phone sample, and 24% in the web panel sample (it should be noted that the survey period was only 3.5 days; higher response rates typically require a longer data collection period). The median completion time for the questionnaire was 17 minutes (15 minutes for web responses and 22 minutes for phone responses).

During the data collection, the sample was monitored to ensure proportional representation by gender, age, place of residence, and ethnicity. A reminder message was sent two days after the start of the survey to underrepresented groups.

After data cleaning (removing 50 inattentive responses with uniform answers to reversed items), the final analytic sample comprised n = 1206 individuals.

All analyses were conducted using unweighted data. In population studies, descriptive statistics are often presented using weights to approximate representativeness of the general population as possible. However, data weighting introduces risks such as distortion or manipulation of results. We also verified that the impact of weighting the results would be minimal and statistically negligible. This is likely due to the rigorous data collection procedures employed in the study, which helped ensure a sample that was already broadly representative of the target population.

Ethical Considerations

The survey used in the present study was implemented by the Estonian Ministry of Social Affairs, which adheres to strict ethical standards in the planning and execution of population-based data collection. As part of these procedures, participation in the survey was entirely voluntary, and respondents were informed about the purpose of the study, data protection measures, and their right to withdraw at any time without any consequences. Informed consent was obtained from all participants.

The Ministry follows national and EU regulations for data protection and research ethics, including the General Data Protection Regulation (GDPR). All data were anonymized prior to analysis to protect the privacy and confidentiality of participants. No personally identifiable information was accessible to the researchers conducting the present analyses.

Data Analysis

The data was analysed using a multi-step psychometric validation strategy aimed at evaluating both the internal structure and cross-group consistency of the BRS and the PAS8. Given the mixed administration formats (online survey vs. phone interview) and two languages (Estonian and Russian), it was essential to employ robust statistical methods to ensure validity and reliability across conditions.

Analyses were conducted using JASP (0.19.3) and R (lavaan package), with robust maximum likelihood estimation (MLR) and Satorra-Bentler corrections applied to account for non-normality and heteroscedasticity.

An **Exploratory Factor Analysis (EFA)** was conducted on the Estonian subsample (n = 663) to investigate the underlying factor structure of the original PASS. The minimum residuals method with promax rotation was used for factor extraction, and parallel analysis was employed to determine the optimal number of factors. Based on empirical and theoretical considerations, this process led to the construction of a refined 8-item version, later referred to as PAS8.

Descriptive statistics, including means and standard deviations for each item and factor of the final PAS8, were then calculated. These statistics helped characterize the distribution of scores in the adapted scale.

To evaluate the internal structure of the BRS and the newly derived PAS8, **Confirmatory Factor Analysis (CFA)** was conducted separately for each scale. For the BRS, a unidimensional model was tested, while for PAS8, a hierarchical four-factor model was specified corresponding to the four factors identified in EFA. The models were estimated using robust maximum likelihood estimation (MLR) with Satorra-Bentler corrections to account for potential non-normality and heteroscedasticity.

Model fit was evaluated using the following indices:

- *RMSEA* (Root Mean Square Error of Approximation): Provides an estimate of the model's approximate fit to the population covariance matrix. Values ≤ 0.06 are considered excellent, and ≤ 0.08 acceptable (Hu & Bentler, 1999).
- *SRMR* (Standardized Root Mean Square Residual): Represents the average discrepancy between observed and model-implied correlations. Values ≤ 0.08 are considered indicative of good fit (Hu & Bentler, 1999).
- *CFI* (Comparative Fit Index): Compares the fit of the hypothesized model to a null model. Values ≥ 0.90 are considered acceptable, and ≥ 0.95 excellent (Bentler, 1990; Hu & Bentler, 1999).
- *TLI (*Tucker–Lewis Index): Similar to CFI but penalizes for model complexity. Values ≥ 0.90 reflect acceptable fit, and ≥ 0.95 excellent fit (Tucker & Lewis, 1973; Hu & Bentler, 1999).

Internal consistency was evaluated using Cronbach's alpha (α), with values $\alpha \geq 0.70$ indicating acceptable reliability and $\alpha \geq 0.80$ considered good reliability (e.g., George & Mallery, 2003; Nunnally & Bernstein, 1994).

Measurement invariance was examined through **multigroup CFA** to determine if the scales functioned equivalently across languages (Estonian vs. Russian) and administration formats (online survey vs. phone interview). A stepwise procedure was used to assess configural, metric, and scalar invariance.

While CFA was used to verify the internal structure and model fit of the BRS and PAS8, **Structural Equation Modeling (SEM)** was employed to more comprehensively assess construct validity. Following established SEM guidelines (Worthington & Whittaker, 2006), **convergent validity** was evaluated through high standardized factor loadings and Average Variance Extracted (AVE) values above 0.50. **Discriminant validity** was supported when inter-factor correlations were lower than the square root of the AVE and cross-loadings were minimal.

In addition, **linear regression analyses** were conducted to examine the associations between PAS8 and BRS scores and mental health indicators, controlling for relevant covariates. These analyses support the **predictive validity** of both instruments.

Results

Exploratory Factor Analysis for PAS8

Given the lack of prior validation of PASS in Estonian or Russian, an exploratory factor analysis (EFA) was conducted to examine its underlying structure and assess whether a shorter, psychometrically sound version could be derived. Only the Estonian-language dataset (n = 663) was used for EFA, in line with recommendations to separate EFA and CFA samples to avoid overfitting and circular validation (Worthington & Whittaker, 2006). Confirmatory factor analysis (CFA) was subsequently conducted on both language versions to evaluate the internal structure of the scales. The Russian-language sample (n = 543) served as the primary test of the stability and cross-language generalizability of the factor structure identified through EFA in the Estonian dataset.

Table 1 presents the PAS8 factor structure from EFA. Two items with the highest loadings per factor were selected, resulting in the final 8-item scale named *8-item Positive Appraisal Style questionnaire* (PAS8). This solution preserved both conceptual clarity and practical brevity, making the instrument well-suited for use in population-level assessments of positive appraisal style.

The decision to develop the 8-item Positive Appraisal Style questionnaire (PAS8) from the full PASS item pool was supported by both empirical findings and theoretical considerations, aiming to preserve conceptual clarity while improving measurement efficiency in resource-constrained research settings. Based on EFA results, a four-factor solution was identified as optimal, guided by parallel analysis and promax rotation. The factor loadings of all 14-items of the PASS are presented in Table B1 (Appendix B).

While PAS8 is primarily intended to be used as a unified total scale, subscale scores can also be computed. However, with only two items per subscale, psychometric precision may be limited. The subscales were also strongly intercorrelated (r = 0.50–0.70), indicating a shared underlying structure. Nonetheless, the shortened scale retained strong internal consistency and cultural validity, supporting its suitability for large-scale assessments.

Final versions of PAS8 in Estonian and Russian are presented in Appendix A2 and Appendix A4, respectively.

Tabel 1

PAS8 factor structure and item loadings from EFA(Estonian version scores, n = 663).

Item No. in PASS	Item No. in PAS8	Item Text	F1 Optimism	F2 Coping Efficacy	F3 No worries	F4 Silver Lining
1	**1**	Arvan, et iga raske olukord saab ükskord läbi. (*I think that every difficult situation will end eventually)*	0.13	**0.75**	–0.04	–0.13
2	**2**	Arvan, et tulen toime ka kõige hullemate olukordadega. *(I think that I can deal successfully even with even the worst situation.)*	–0.06	**0.83**	–0.11	0.04
3	**3**	Arvan, et ka halval on mingi mõte. *(I think that even bad things have a meaning.)*	–0.15	0.31	–0.08	**0.56**
4	**4**	Arvan, et pisiasjadel ei tohiks end häirida lasta. (*I think that you should not be rattled by small things.)*	0.07	0.11	**0.42**	0.05
5	**5**	Arvan, et kui pole teada, mis ees ootab, tasub eeldada parimat. *(I think that it is better to assume a good ending if you don't know what is coming.)*	**0.69**	–0.11	0.00	0.08
6	**6**	Üldiselt näen asju pigem optimistlikult. *(I tend to see things rather optimistically.)*	**0.91**	–0.04	–0.01	–0.11
11	**7**	Arvan, et sääsest ei peaks elevanti tegema. (*I think that you shouldn't make mountains out of molehills.)*	–0.04	–0.12	**0.97**	–0.02
14	**8**	Arvan, et see, mis algselt näib halb, osutub sageli siiski heaks. *(I think that things that initially seem bad often turn out well in the end.)*	0.17	–0.26	0.05	**0.79**

Note. Loadings ≥ 0.40 are shown in **bold**. English item wordings (in *italics*) originate from the PASS publication article by Petri-Romão et al. (2023) and serve as translations to non-Estonian readers. Items in English were <u>not</u> analyzed in this study.

Descriptive Statistics

Table 2 offers an overview of the sample characteristics and distribution of resilience and positive appraisal style scores across key variables. It presents the means and standard deviations for the BRS and PAS8 total scores and subscales, reported separately by questionnaire language (Estonian vs. Russian). Other demographic variables provided are: age group, sex, education level, residential area, and survey method (online survey vs. phone interview).

Table 2

Descriptive statistics of the sample and questionnaire norms from raw scores (measured on a scale from 1...5, where 1 = disagree and 5 = agree)

				BRS		PAS8		PAS8: Optimism		PAS8: Coping efficacy		PAS8: No worries		PAS8: Silver lining	
		n	%	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Full sample		1,206	100,0%	3,32	0,75	3,83	0,63	3,79	0,92	3,98	0,77	4,11	0,73	3,42	0,88
Questionnaire language	Estonian	663	55,0%	3,37	0,72	3,79	0,61	3,66	0,91	4,00	0,73	4,05	0,74	3,46	0,84
	Russian	543	45,0%	3,27	0,79	3,87	0,65	3,95	0,90	3,95	0,82	4,19	0,71	3,38	0,92
Residential area	Tallinn/Capital	313	26,0%	3,33	0,77	3,82	0,63	3,73	0,95	4,03	0,75	4,13	0,72	3,39	0,93
	Other bigger city	323	26,8%	3,30	0,73	3,85	0,65	3,90	0,95	3,98	0,79	4,13	0,73	3,41	0,91
	Small City/town	256	21,2%	3,23	0,78	3,81	0,65	3,79	0,89	3,88	0,80	4,13	0,75	3,45	0,84
	Rural area	314	26,0%	3,42	0,72	3,82	0,60	3,74	0,86	4,01	0,74	4,06	0,73	3,46	0,81
Education	Level 1	125	10,4%	3,31	0,75	3,75	0,71	3,68	0,94	3,84	0,87	4,02	0,77	3,45	0,95
	Level 2	755	62,6%	3,29	0,76	3,84	0,62	3,80	0,90	3,98	0,76	4,14	0,71	3,43	0,86
	Level 3	326	27,0%	3,40	0,73	3,83	0,63	3,81	0,94	4,02	0,76	4,10	0,76	3,40	0,88
Survey method	Online	968	80,3%	3,26	0,74	3,74	0,62	3,68	0,90	3,91	0,77	4,02	0,72	3,36	0,86
	Interview	238	19,7%	3,58	0,75	4,18	0,54	4,26	0,84	4,27	0,69	4,49	0,66	3,70	0,90
Sex	Male	539	44,7%	3,50	0,71	3,83	0,60	3,71	0,94	4,04	0,72	4,20	0,70	3,38	0,89
	Female	667	55,3%	3,18	0,76	3,82	0,65	3,85	0,90	3,93	0,81	4,05	0,75	3,46	0,87
Age	15-24 y.o.	138	11,4%	3,35	0,77	3,77	0,64	3,52	1,04	4,07	0,87	3,97	0,74	3,52	0,92
	25-34 y.o.	180	14,9%	3,36	0,70	3,79	0,63	3,60	0,97	4,04	0,78	4,10	0,71	3,44	0,94
	35-49 y.o.	282	23,4%	3,36	0,80	3,82	0,65	3,80	0,91	4,03	0,73	4,08	0,75	3,37	0,88
	50-64 y.o.	286	23,7%	3,28	0,81	3,81	0,60	3,83	0,87	3,90	0,76	4,15	0,70	3,37	0,82
	65-74 y.o.	182	15,1%	3,28	0,70	3,89	0,65	4,02	0,86	3,93	0,79	4,21	0,74	3,42	0,90
	75+ y.o.	138	11,4%	3,31	0,65	3,88	0,61	3,90	0,81	3,94	0,71	4,15	0,73	3,54	0,84

Note: **Education Level 1**: Primary or basic education; vocational education based on basic education; **Level 2:** Secondary or upper-secondary education; vocational education based on secondary education; **Level 3**:Higher education

Internal Consistency

The internal consistency of both scales was assessed using Cronbach's alpha, which yielded coefficients ranging from 0.81 to 0.83 across the Estonian and Russian versions as well as

between self-administered and interviewer-administered formats, indicating good reliability. Specific internal consistency values are presented in the next section, together with CFA results in, Table 3.

Confirmatory factor analysis

Confirmatory factor analysis (CFA) supported the hypothesized factor structures for both scales. For the BRS, a unidimensional model was confirmed with strong fit indices across Estonian and Russian versions, although the Russian version initially required minor model adjustments due to item valence effects. For the PAS8, a four-factor model was specified in accordance with the structure identified in exploratory analysis.

Model fit indices indicated good to excellent fit across both language versions and administration formats (online survey vs. phone interview), providing structural validation for the use of both instruments in culturally and methodologically diverse subgroups. Summary statistics for model fit are presented in Table 3, together with internal consistency (Cronbach's α) values.

Table 3

Internal Consistency (Cronbach's α) and CFA Model Fit Indices

Scale	n	α	RMSEA	SRMR	CFI	TLI
BRS-EST	663	0.826	0.068	0.031	0.978	0.963
BRS-RUS	543	0.815	0.092	0.033	0.976	0.929
PAS8-EST	663	0.809	0.068	0.035	0.966	0.94
PAS8-RUS	543	0.826	0.051	0.031	0.938	0.97

Although the BRS-RUS *RMSEA* value of 0.092 (Table 3) slightly exceeds conventional thresholds, the *RMSEA* index is known to overestimate misfit in models with moderate sample sizes, multiple latent variables, and lower degrees of freedom (Kenny et al., 2015). Given that all other fit indices indicated acceptable or strong model fit, and the factor structure was theoretically coherent, the overall model was considered acceptable.

Measurement Invariance

Measurement invariance was assessed through multi-group confirmatory factor (MG-CFA) analysis to determine whether the BRS and the PAS8 scales function equivalently across

survey administration formats (online survey vs. phone interview) and two language groups (Estonian vs. Russian). Four increasingly strict levels of invariance were tested sequentially: configural invariance (equal factor structure), metric invariance (equal factor loadings), scalar invariance (equal intercepts), and residual invariance (equal error variances).

Each level imposed additional constraints to determine whether the constructs were measured similarly across groups. Fit indices and change thresholds ($\Delta CFI < 0.01$, $\Delta RMSEA < .0015$, $\Delta SRMR < 0.030$) were used to assess model fit at each step (Putnick & Bornstein, 2016; Marsh et al., 2004). Measurement invariance results are presented in Tables 4–9.

BRS: Estonian (online survey vs. phone interview) - Table 4

The Estonian version of BRS achieved scalar invariance across administration formats. This suggests that both the structure and item means were consistent across online survey vs. phone interview, allowing for meaningful mean-level comparisons.

Table 4

Measurement invariance of BRS-EST between the online survey and phone interview

Invariance Level	***χ2 (df)***	***RMSEA*** **< 0,08**	***SRMR*** **< 0,08**	***CFI*** **> 0,90**	***TLI*** **> 0,90**	***Δχ2 (Δdf)*** ***p* > 0,05**	***ΔRMSEA*** **< 0,015**	***ΔSRMR*** **< 0,030** **< 0,015**	***ΔCFI*** **< 0,01**
Same items - **YES** *configural invariance*	33,98 (18)	0,059	0,029	0,983	0,971				
Same loadings - **YES** *metric invariance*	40,62 (23)	0,054	0,036	0,981	0,976	6,42 (5)	-0,005	0,006	-0,001
Same intercepts - **YES** *scalar invariance*	51,21 (28)	0,055	0,039	0,977	0,975	11,11 (5)*	0,001	0,003	-0,005
Same residuals - **NO** *residual invariance*	73,74 (34)	0,081	0,059	0,938	0,946	15,37 (6)*	0,026	0,020	-0,038

*** $p < 0.001$; ** $p < 0.01$: * $p < 0.05$.

BRS: Russian (online survey vs. phone interview) - Table 5

The Russian version of BRS achieved metric invariance, supporting structural comparability across modes. However, scalar invariance was not established, indicating that mean-level comparisons should be interpreted with caution.

Table 5

Measurement invariance of BRS-RUS between the online survey vs. phone interview

Invariance Level	***χ2* (*df*)**	***RMSEA*** **< 0,08**	***SRMR*** **< 0,08**	***CFI*** **> 0,90**	***TLI*** **> 0,90**	***Δχ2* (*Δdf*)** **p > 0,05**	***ΔRMSEA*** **< 0,015**	***ΔSRMR*** **< 0,030** **< 0,015**	***ΔCFI*** **< 0,01**
Same items - **YES** *configural invariance*	65,04 (18)	0,112	0,048	0,942	0,904				
Same loadings - **YES** *metric invariance*	71,83 (23)	0,102	0,050	0,938	0,919	8,06 (5)	-0,009	0,002	-0,004
Same intercepts - **NO** *scalar invariance*	96,01 (28)	0,105	0,055	0,920	0,915	29,59 (5)***	0,003	0,005	-0,018
Same residuals - **NO** *residual invariance*	115,69 (34)	0,135	0,077	0,840	0,859	20,26 (6)**	0,030	0,023	-0,081

*** $p < 0.001$; ** $p < 0.01$: * $p < 0.05$.

BRS: Cross-Language Comparison - Table 6

When comparing Estonian and Russian BRS versions, **metric invariance** was established, but **scalar invariance** was not. This indicates that while structural equivalence was present, response scale differences may limit cross-language mean comparisons.

Table 6

Measurement invariance of BRS between the Estonian and Russian versions

Invariance Level	***χ2* (*df*)**	***RMSEA*** **< 0,08**	***SRMR*** **< 0,08**	***CFI*** **> 0,90**	***TLI*** **> 0,90**	***Δχ2* (*Δdf*)** **p > 0,05**	***ΔRMSEA*** **< 0,015**	***ΔSRMR*** **< 0,030** **< 0,015**	***ΔCFI*** **< 0,01**
Same items - **YES** *configural invariance*	90,45 (18)	0,099	0,038	0,952	0,921				
Same loadings - **YES** *metric invariance*	110,39 (23)	0,094	0,052	0,945	0,928	18,96 (5)*	-0,005	0,015	-0,007
Same intercepts - **NO** *scalar invariance*	195,15 (28)	0,113	0,067	0,903	0,896	122,64 (5)***	0,019	0,014	-0,042
Same residuals - **NO** *residual invariance*	229,16 (34)	0,115	0,075	0,878	0,893	35,94 (6)**	0,002	0,009	-0,025

*** $p < 0.001$; ** $p < 0.01$: * $p < 0.05$.

PAS8: Estonian (online survey vs. phone interview) - Table 7

PAS8 in Estonian demonstrated scalar invariance, indicating consistent item functioning and comparable mean scores across administration formats.

Table 7

Measurement invariance of PAS8-EST between the online survey and phone interview

Invariance Level	***χ2* (*df*)**	***RMSEA*** **< 0,08**	***SRMR*** **< 0,08**	***CFI*** **> 0,90**	***TLI*** **> 0,90**	***Δχ2* (*Δdf*)** **p > 0,05**	***ΔRMSEA*** **< 0,015**	***ΔSRMR*** **< 0,030** **< 0,015**	***ΔCFI*** **< 0,01**
Same items - **YES** *configural invariance*	76,28 (32)	0,071	0,038	0,960	0,931				
Same loadings - **YES** *metric invariance*	85,28 (39)	0,065	0,041	0,960	0,943	7,34 (7)	-0,007	0,003	0,000
Same intercepts - **YES** *scalar invariance*	99,32 (42)	0,069	0,045	0,951	0,935	14,71 (3)**	0,004	0,003	-0,009
Same residuals - **NO** *residual invariance*	112,52 (50)	0,071	0,051	0,938	0,931	15,58 (8)*	0,002	0,006	-0,013

*** $p < 0.001$; ** $p < 0.01$: * $p < 0.05$.

PAS8: Russian (online survey vs. phone interview) - Table 8

PAS8 in Russian reached metric invariance, suggesting similar factor structures and loadings, but scalar invariance was not confirmed—again limiting interpretation of mean scores across formats.

Table 8

Measurement invariance of **PAS8-RUS** between the online survey and phone interview

Invariance Level	***χ2* (*df*)**	***RMSEA*** **< 0,08**	***SRMR*** **< 0,08**	***CFI*** **> 0,90**	***TLI*** **> 0,90**	***Δχ2* (*Δdf*)** **p > 0,05**	***ΔRMSEA*** **< 0,015**	***ΔSRMR*** **< 0,030** **< 0,015**	***ΔCFI*** **< 0,01**
Same items - **YES** *configural invariance*	48,42 (32)	0,051	0,037	0,981	0,966				
Same loadings - **YES** *metric invariance*	54,39 (39)	0,046	0,046	0,981	0,973	6,84 (7)	-0,005	0,009	0,000
Same intercepts - **NO** *scalar invariance*	68,49 (42)	0,058	0,050	0,967	0,957	15,55 (3)**	0,012	0,004	-0,013
Same residuals - **NO** *residual invariance*	71,66 (50)	0,053	0,061	0,968	0,964	7,68 (8)	-0,006	0,011	0,001

*** $p < 0.001$; ** $p < 0.01$: * $p < 0.05$.

PAS8: Cross-Language Comparison - Table 9

Comparison of Estonian and Russian PAS8 versions supported metric invariance, but scalar invariance was not achieved. This supports valid structural interpretation, but mean-level comparison may be affected by linguistic or cultural differences.

Table 9

Measurement invariance of PAS8 between the Estonian and Russian versions

Invariance Level	***χ2* (*df*)**	***RMSEA*** **< 0,08**	***SRMR*** **< 0,08**	***CFI*** **> 0,90**	***TLI*** **> 0,90**	***Δχ2* (*Δdf*)** **p > 0,05**	***ΔRMSEA*** **< 0,015**	***ΔSRMR*** **< 0,030** **< 0,015**	***ΔCFI*** **< 0,01**
Same items - **YES** *configural invariance*	85,20 (32)	0,061	0,030	0,974	0,955				
Same loadings - **YES** *metric invariance*	97,8 (39)	0,057	0,038	0,972	0,959	12,07 (7)	-0,003	0,009	-0,002
Same intercepts - **NO** *scalar invariance*	146,62 (42)	0,073	0,047	0,950	0,934	57,75 (3)***	0,016	0,008	-0,021
Same residuals - **NO** *residual invariance*	166,94 (50)	0,073	0,051	0,942	0,935	21,81 (8)**	-0,001	0,004	-0,009

*** $p < 0.001$; ** $p < 0.01$: * $p < 0.05$.

To summarise most important results of measurement invariance:

- BRS-EST achieved scalar invariance across modes, indicating full comparability for means.
- BRS-RUS reached metric invariance, suggesting structural comparability, but scalar invariance was not met, suggesting mean comparisons should be interpreted with caution.
- PAS8-EST also demonstrated scalar invariance, allowing valid mean comparisons across formats.
- PAS8-RUS showed metric invariance, supporting structural but not mean-level comparability.
- Between-language comparisons supported metric invariance for both scales, but scalar invariance was not established, again suggesting mean comparisons should be interpreted with caution.

These results support the structural equivalence of both instruments, with some limitations for mean-level comparisons in the Russian-language versions. Cultural or linguistic differences – such as interpretation of negatively worded items – may account for the differences in scalar invariance, especially for the Russian BRS.

Construct Validity

Convergent validity was assessed by examining associations between BRS/PAS8 scores and validated external criteria:

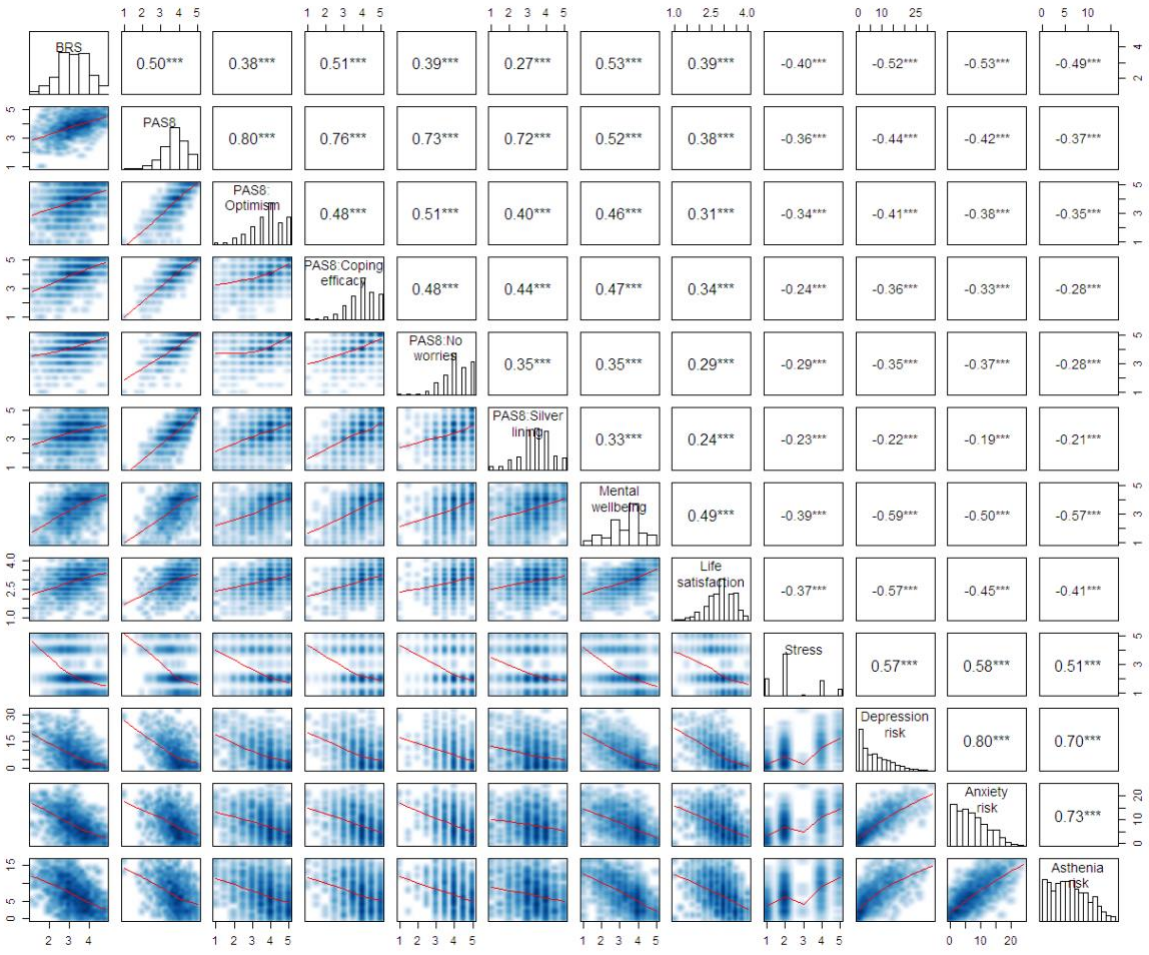
- Positive correlations with life satisfaction and mental well-being (EMHS scale);
- Negative correlations with EEK-2 indicators of depression, anxiety, and asthenia.

Presented in Figure 1, all associations were in the expected direction and statistically significant ($p < .001$), confirming the relevance of both scales as indicators of resilience and positive appraisal.

Divergent validity was supported by low correlations ($r < 0.5$) with demographic and unrelated psychological constructs, indicating the scales' specificity.

Figure 1

Variations and covariations of resilience, mental well-being, and mental distress scores.



Note. Numbers represent Spearman correlation coefficients. *** $p < .001$; ** $p < .01$; * $p < .05$. $n = 1206$.

Moderating Role of Resilience

To test whether BRS and PAS8 buffered the effects of stress on mental health, four linear regression models were conducted (Table 10; illustrated by Figure 2). Each model included the main effects of stress and resilience (as measured by either BRS or PAS8), as well as their interaction term (Stress × Resilience). The dependent variables were mental well-being and depression risk. Well-being scores were based on items from the EMHS mental well-being scale, and depression risk was assessed using the EST-Q2 depression subscale.

- ***Mental Well-Being***

Higher stress was associated with lower well-being (β = –0.33 for BRS; β = –0.50 for PAS8), while higher resilience predicted higher well-being (β = 0.42 for BRS; β = 0.41 for PAS8). Significant interaction effects (β = 0.05 for BRS; β = 0.09 for PAS8) indicated that both scales buffered the negative effect of stress on well-being. These models explained 33.2% and 33.4% of the variance in well-being, with large effect sizes (f^2 = 0.497 and 0.502, respectively).

- ***Depression Risk***

Higher stress was associated with greater risk of depression symptoms (β = 3.36 for BRS; β = 5.66 for PAS8). Resilience was negatively associated with depression risk (β = –2.20 for BRS; β = –0.76 for PAS8). Significant interaction terms (β = –0.33 for BRS; β = –0.85 for PAS8) indicated that higher resilience weakened the relationship between stress and depression risk. The models explained 44.5% and 42.9% of the variance in depression risk, with corresponding large effect sizes (f^2 = 0.802 and 0.751).

Table 10. *Linar regression models representing effects of stress, resilience, and their interaction on well-being (EMHS scale) and depression risk (EST-Q2 scale*).

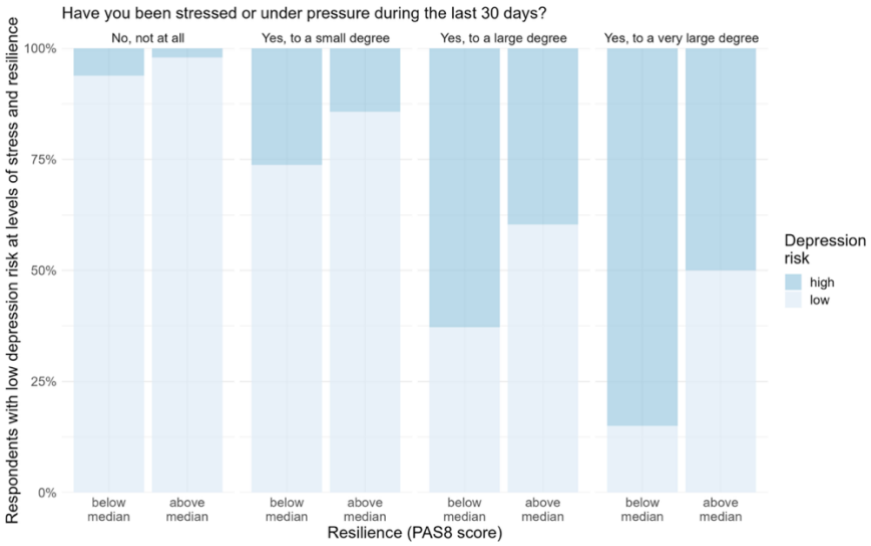
Outcome	Stress (β)	Resilience (β)	Stress × Resilience (β)	R^2	Effect size (f^2)
mental well-being (*stress * BRS*)	-0.33 [-0.48 – -0.18]***	0.42 [0.29 – 0.55]***	0.05 [0.01 – 0.10]*	0.332	0.497
mental well-being (*stress * PAS8*)	-0.50 [-0.70 – -0.31]***	0.41 [0.25 – 0.56]*	0.09 [0.04 – 0.14]***	0.334	0.502
depression risk (*stress * BRS*)	3.36 [2,40 – 4,32]***	-2.20 [-3,05 – -1,34]***	-0.33 [-0,62 – -0,03]*	0.445	0.802
depression risk (*stress * PAS8*)	5.66 [4.36 – 6.96]***	-0.76 [-1.80 – 0.29]	-0.85 [-1.19 – -0.50]***	0.429	0.751

Note. Regression coefficients (β) from four regression analyses, along with 95% confidence intervals, and *p*-values:* ***$p < .001$; *$p < .01$; $p < .05$. $n = 1206$.

These interactions support the theoretical claim that resilience operates as a protective factor against psychological distress in the context of stress.

Figure 2

Proportion of respondents with and without depression risk across different levels of stress and resilience



Discussion

This study evaluated the psychometric properties of two theoretically grounded instruments – the Brief Resilience Scale (BRS) and the Positive Appraisal Style Scale (PAS8) – adapted for Estonian and Russian speakers. The results provide support for the reliability, structural validity, and cultural applicability of both instruments, making them suitable for large-scale resilience monitoring in Estonia.

Psychometric Properties and Internal Consistency

Internal consistency for both BRS and PAS8 was good across language versions and administration formats, with Cronbach's alpha values ranging from 0.81 to 0.83. These findings meet established benchmarks for acceptable reliability (George & Mallery, 2003; Nunnally & Bernstein, 1994) and align with prior research on the BRS (Smith et al., 2008; Fung, 2020) and the PASS framework (Petri-Romão et al., 2023).

Factor Structure: Structural Validity

Confirmatory factor analysis (CFA) supported the hypothesized latent structures for both adapted scales: a unidimensional model for the Brief Resilience Scale (BRS) and a four-

factor model for the Positive Appraisal Style short form (PAS8). These four factors – optimism, coping efficacy, no-worries thinking, and silver-linings thinking – are theoretically grounded in the Positive Appraisal Style Theory of Resilience (PASTOR; Kalisch et al., 2015), which conceptualizes resilience as a dynamic outcome maintained by habitual positive appraisal tendencies. In the Russian version of the BRS, minor modifications were necessary to account for valence-related response patterns, likely reflecting known issues with the interpretation of negatively worded items across linguistic and cultural contexts (e.g., Hidalgo-Rasmussen et al., 2019).

The PAS8 was derived post hoc as an empirically informed strategy to improve measurement efficiency and conceptual clarity in large-scale, population-based research. Exploratory factor analysis (EFA) guided the item reduction process: the eight selected items exhibited consistently moderate to high loadings (range: 0.52–0.70) on a unidimensional solution and emerged as stable primary indicators across two- and three-factor models. This indicated that the items reflect a coherent and internally consistent latent construct, with minimal redundancy or measurement error. In contrast, several of the excluded items (e.g., item 10) showed weaker or ambiguous loadings and potential cross-loading, suggesting measurement of tangential or less well-defined content domains.

Factor structure: Content Validity

Beyond statistical considerations, the PAS8 was also optimized for conceptual coherence and theoretical alignment. The eight retained items specifically target core aspects of adaptive positive appraisal, including optimistic outlook, cognitive reframing of challenges, and belief in one's ability to cope effectively. By centering on these foundational constructs, the PAS8 avoids the heterogeneity introduced by items that may reflect adjacent but distinct psychological domains, such as personal values, defensive minimization, or rigid optimism. As a result, the shortened scale achieves a tighter conceptual focus, enhancing interpretability.

To further elaborate the structural and construct validity of the PAS8, the four identified factors reflect distinct yet theoretically grounded dimensions of positive appraisal style:

1. **Optimism** (*Optimism*) – Reflects a tendency to expect positive outcomes and interpret uncertainty through a hopeful lens. These future-oriented expectations have been

consistently linked to stress regulation and resilience (Carver et al., 1989; Cheung et al., 2023).

1.1. PAS8 item No. 6: *Arvan, et kui pole teada, mis ees ootab, tasub eeldada parimat.*

1.2. PAS8 item No. 5: *Arvan, et iga raske olukord saab ükskord läbi.*

2. **Coping efficacy** (*Usk toimetulekusse*) – Reflects belief in one's ability to manage difficult situations, a key internal resource for adaptive functioning under stress (Kalisch et al., 2015).

   2.1. PAS8 item No. 2: *Arvan, et tulen toime ka kõige hullemate olukordadega*.

   2.2. PAS8 item No. 1: *Arvan, et iga raske olukord saab ükskord läbi*.

3. **No worries** (*Halva alatähtsustamine*) – Reflects a tendency to minimize the emotional impact of minor stressors, aligning with threat downregulation in the resilience literature (Windle et al., 2011).

   3.1. PAS8 item No. 7: *Arvan, et sääsest ei peaks elevanti tegema.*

   3.2. PAS8 item No. 4: *Arvan, et pisiasjadel ei tohiks end häirida lasta.*

4. **Silver lining** (*Halvas hea nägemine*) – Reflects the ability to identify meaning or positive elements in adversity, a core mechanism in reappraisal (Carver et al., 1989; Kampa et al., 2018; Tugade & Fredrickson, 2004).

   4.1. PAS8 item No. 8: *Arvan, et see, mis algselt näib halb, osutub sageli siiski heaks.*

   4.2. PAS8 item No. 3: *Arvan, et ka halval on mingi mõte.*

Measurement Invariance

Results of measurement invariance testing supported configural and metric invariance across both language versions and administration formats, indicating structural equivalence. Scalar invariance was achieved for the Estonian versions, allowing valid mean comparisons, but not for the Russian versions, where only metric invariance was established. This suggests that while the constructs are measured similarly across groups, mean-level comparisons involving the Russian versions should be interpreted with caution. These differences may reflect subtle linguistic or cultural influences on item interpretation, highlighting the importance of continued refinement and contextual validation in multilingual research.

Validity

Convergent validity was supported by moderate to strong correlations between BRS and PAS8 scores and indicators of mental well-being and life satisfaction, as well as negative associations with symptoms of depression, anxiety, and asthenia. Divergent validity was

indicated by low correlations with unrelated demographic variables. In addition, both BRS and PAS8 significantly moderated the relationship between stress and mental health outcomes: individuals with higher resilience scores experienced fewer negative effects of stress on well-being. This stress-buffering effect underscores the instruments' role as protective psychological factors and provides further support for their construct validity. These findings are consistent with the PASTOR framework, which highlights the central role of positive appraisal in resilience processes.

Adaptation and Theoretical Integration

The adaptation process followed international guidelines of the back-translation method (e.g., Beaton et al., 2000), including expert consultations, and pilot testing. The selection of the Content version of PASS and the subsequent development of the PAS8 via EFA were driven by empirical analysis and practical considerations. The development of PAS8 resulted in a coherent and efficient instrument suitable for population-level monitoring.

Importantly, this study also confirms that the cognitive constructs emphasized in the PASTOR framework – such as positive expectations, belief in coping, and reframing adversity – are relevant and measurable across languages and formats. This supports the use of appraisal-focused instruments in both applied research and mental health intervention planning.

Limitations and Future Directions

Several limitations of this study should be acknowledged. First, the cross-sectional design precluded assessment of test–retest reliability and predictive validity. Future longitudinal research is needed to evaluate the temporal stability of resilience scores and their relevance for mental health outcomes.

Second, although the PAS8 provides a clear and interpretable four-factor structure, the two-item subscales may limit psychometric precision. Expanding these subscales in future adaptations could improve sensitivity, particularly in clinical or diagnostic settings. Moreover, while the identified factor structure captures key aspects of positive appraisal style, some conceptual dimensions emphasized in the broader PASTOR framework – such as appraisal flexibility, tolerance of ambiguity, and socially informed appraisals – may be underrepresented. These could be valuable directions for future item development and scale refinement.

Third, challenges emerged in the Russian version of the BRS, where negatively worded items appeared to introduce response variability and reduce model fit. These effects may reflect cultural or linguistic differences in item interpretation and could be addressed through rewording or balancing item valence.

Fourth, while the instruments functioned well in Estonian and Russian samples within Estonia, their generalizability to other populations remains untested. Future research should extend validation efforts to Russian-speaking populations outside Estonia and to other cultural contexts more broadly.

Finally, it would be valuable to assess the sensitivity of both instruments to change over time, for example in response to interventions, as well as to test measurement invariance longitudinally to ensure structural consistency across repeated administrations. These steps would strengthen their applicability in both research and applied public health settings.

Conclusion

The main aim of this thesis was to provide easy-to-administer, reliable, and valid tools for assessing resilience and positive appraisal style in the Estonian population. The adapted versions of the BRS and PAS8 demonstrated good psychometric properties and cross-cultural applicability making them promising instruments for assessing resilience and related aspects of mental health at the population level. The alignment of the scales with established theoretical models of resilience, particularly the PASTOR framework, supports their potential utility in both research and applied settings.

As for future directions, test–retest reliability and predictive validity should be examined in longitudinal studies. Subtle indications in the Russian BRS version suggest that negatively worded items may introduce response variation, pointing to potential areas for refinement in future adaptations. Future research across different populations and contexts would help clarify the generalizability of these scales. In addition, the development of PAS8 subscales could enhance the instrument's precision and usefulness in clinical or research applications.

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Appendices

Appendix A

Adapted survey forms

Note: Unconventional formatting of tables of Appendix A to present whole scales in printable survey-format in the following order:

SÄILENÕTKUSE LÜHISKAALA BRS-EST

Palun märkige, mil määral te nõustute järgmiste väidetega:

Palun märkige igale reale vaid üks vastus!

	Ei nõustu	Pigem ei nõustu	Nii ja naa	Pigem nõustun	Nõustun
1. Saan pärast raskeid aegu üldiselt kiiresti jalule.	1	2	3	4	5
2. Mul on raskusi stressirohketes olukordades vastupidamisega.	1	2	3	4	5
3. Mul ei lähe kaua, et stressirohkest olukorrast taastuda.	1	2	3	4	5
4. Mul on raske ebameeldivatest sündmustest üle saada.	1	2	3	4	5
5. Üldiselt tulen raskete aegadega vähese vaevaga toime.	1	2	3	4	5
6. Vajan elu tagasilöökidest ülesaamiseks üldjuhul kaua aega.	1	2	3	4	5

Märkus: 2, 4 ja 6 on pööratud väited

BRS SKOORIMISJUHEND

1. Väidete pööramine: BRSi tulemuste arvutamiseks on esmalt tarvis pöörata ümber negatiivselt sõnastatud väidete 2, 4 ja 6 skoorid. Kuna kõik väited on hinnatud skaalal 1-5, peaks pööratud väited omandama tagasi pööramise järgselt vastavalt väärtused 5 -> 1, 4 -> 2, 2 -> 4 ja 1 -> 5. Seejuures 3 peaks säilitama väärtuse (3=3).

2. Koondskoori arvutamine: Pärast negatiivselt sõnastatud väidete skooride ümber kodeerimist, võib koondskoori esitada kas (a) skooride summana või (b) aritmeetilise keskmise kaudu:

a) *Skooride summa:* Hõlmab endas kõikide skooride liitmist, mille tulemus jääb vahemikku 6-30.
b) *Keskmine skoor:* Leia väidete aritmeetiline keskmine jagades kõikide skooride summa väidete arvuga (6), mis annab tulemuse vahemikus 1.00-5.00.

BRS-EST adaptsioon: Liina Reinart (liina.reinart@ut.ee) ja Andero Uusberg (Tartu Ülikool)

Originaal *Brief Resilience Scale*: Smith, B.W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P. and Bernard, J. (2008). The Brief Resilience Scale: Assessing the Ability to Bounce Back. *International Journal of Behavioral Medicine*, 15, 194-200.

POSITIIVSE TÕLGENDUSSTIILI KÜSIMUSTIK PAS8-EST

Palun mõelge, kuidas tavaliselt toimite stressirohketes olukordades. Näiteks olukordades, mis on rasked, kurnavad, pingelised, ebakindlad või ebameeldivad. Meenutage, mida te taolistel puhkudel üldiselt tunnete ja mõtlete.

Palun märkige, mil määral te stressirohkes olukorras nõustute järgmiste väidetega. Siin ei ole õigeid ega valesid vastuseid.

Palun märkige igale reale vaid üks vastus.

	Ei nõustu	Pigem ei nõustu	Nii ja naa	Pigem nõustun	Nõustun
1. Arvan, et iga raske olukord saab ükskord läbi.	1	2	3	4	5
2. Arvan, et tulen toime ka kõige hullema olukorraga.	1	2	3	4	5
3. Arvan, et ka halval on mingi mõte.	1	2	3	4	5
4. Arvan, et pisiasjadel ei tohiks end häirida lasta.	1	2	3	4	5
5. Arvan, et kui pole teada, mis ees ootab, tasub eeldada parimat.	1	2	3	4	5
6. Üldiselt näen asju pigem optimistlikult.	1	2	3	4	5
7. Arvan, et sääsest ei peaks elevanti tegema.	1	2	3	4	5
8. Arvan, et see, mis algselt näib halb, osutub sageli siiski heaks.	1	2	3	4	5

PAS8-EST adaptsioon: Liina Reinart (liina.reinart@ut.ee) ja Andero Uusberg (Tartu Ülikool)

Originaal *Positive Appraisal Style Scale*: Petri-Romão et al., (2024). Self-report assessment of Positive Appraisal Style (PAS): Development of a process-focused and a content-focused questionnaire for use in mental health and resilience research. *PLOS ONE*, *19*(2), e0295562. https://doi.org/10.1371/journal.pone.0295562

BRIEF RESILIENCE SCALE BRS-RUS

В какой степени Вы согласны со следующими утверждениями.

ПОЖАЛУЙСТА, ОТМЕТЬТЕ ОДИН ОТВЕТ В КАЖДОМ РЯДУ!

	Не согласны	Скорее не согласны	Ни согласны, ни не согласны	Скорее согласны	Согласны
1. Я обычно быстро прихожу в норму после тяжелых времён	1	2	3	4	5
2. Я с трудом переношу стрессовые ситуации	1	2	3	4	5
3. Мне не требуется много времени, чтобы прийти в себя после стрессовых ситуаций	1	2	3	4	5
4. Мне сложно восстановиться, когда случается что-то плохое	1	2	3	4	5
5. Я обычно без особых проблем справляюсь с тяжелыми временами.	1	2	3	4	5
6. Преодоление жизненных неудач, как правило, занимает у меня много времени	1	2	3	4	5

Note. Items 2, 4, and 6 are reverse coded.

BRS SCORING INSTRUCTIONS

Step 1: Reverse Coding – The first step in scoring is to "reverse code" the items that are negatively worded as indicated by a note at the bottom of each list of items on page 2. Since the items are rated from 1 to 5, the reverse coding involves changing ratings of 5 to 1, 4 to 2, 2 to 4, 1 to 5, and making sure 3 is still 3.

Step 2: Calculating the Total Score – After reverse coding the negatively worded items, the second step is to calculate a total score either by (a) determining the sum or (b) the mean of the individual items as follows:

a. *Summary Score Option* – This involves adding the items, which would result in a total score ranging from 6 to 30 for the six items of the *BRS*.

b. *Mean Score Option* – This involves finding the arithmetic average of the items from the BRS and dividing the sum by the number of items, resulting in a total score of from 1.00 to 5.00.

BRS-RUS adaptation: Liina Reinart (liina.reinart@ut.ee) ja Andero Uusberg (University of Tartu)

Original *Brief Resilience Scale*: Smith, B.W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P. and Bernard, J. (2008). The Brief Resilience Scale: Assessing the Ability to Bounce Back. *International Journal of Behavioral Medicine*, 15, 194-200.

POSITIVE APPRAISAL STYLE SCALE PAS8-RUS

А сейчас, пожалуйста, подумайте о том, как Вы обычно ведете себя в стрессовых ситуациях. Например, в трудных, изнурительных, напряжённых, неопределённых или неприятных ситуациях. Вспомните, что Вы обычно в таких ситуациях чувствуете и думаете?

В какой степени Вы согласны с тем, что следующее в стрессовых ситуациях подходит к Вам?

ПОЖАЛУЙСТА, ОТМЕТЬТЕ ОДИН ОТВЕТ В КАЖДОМ РЯДУ!

	Не согласны	Скорее не согласны	Ни согласны, ни не согласны	Скорее согласны	Согласны
1. Я считаю, что любая трудная ситуация когда-нибудь закончится	1	2	3	4	5
2. Я считаю, что смогу справиться в самых неблагоприятных ситуациях	1	2	3	4	5
3. Я считаю, что даже в плохом есть какой-то смысл	1	2	3	4	5
4. Я считаю, что мелочи не должны выбивать тебя из колеи	1	2	3	4	5
5. Я считаю, что если неизвестно, что ждёт впереди, то стоит надеяться на лучшее	1	2	3	4	5
6. В целом я смотрю на вещи оптимистично	1	2	3	4	5
7. Я считаю, что не следует делать из мухи слона	1	2	3	4	5
8. Я считаю, что то, что поначалу кажется плохим, в итоге часто оказывается хорошим	1	2	3	4	5

PAS8-RUS adaptation: Liina Reinart (liina.reinart@ut.ee) & Andero Uusberg (University of Tartu)

Original *Positive Appraisal Style Scale*: Petri-Romão et al., (2024). Self-report assessment of Positive Appraisal Style (PAS): Development of a process-focused and a content-focused questionnaire for use in mental health and resilience research. *PLOS ONE*, *19*(2), e0295562. https://doi.org/10.1371/journal.pone.0295562

Appendix B

Exploratory Factor Analysis of PASS

Table B1. Factor Loadings for 4-, 3-, 2-, and 1-Factor Solutions.

	4 factors				3 factors			2 factors		1 factor
	F1	F2	F3	F4	F1	F2	F3	F1	F2	F1
*1. Arvan, et iga raske olukord saab ükskord läbi.	0,13	**0,75**	-0,04	-0,13	0,00	0,40	0,33	0,06	0,63	0,65
*2. Arvan, et tulen toime ka kõige hullema olukorraga.	-0,06	**0,83**	-0,11	0,04	-0,14	0,32	0,54	0,00	0,67	0,63
*3. Arvan, et ka halval on mingi mõte.	-0,15	0,31	-0,08	0,56	-0,04	-0,13	**0,77**	0,23	0,32	0,52
*4. Arvan, et pisiasjadel ei tohiks end häirida lasta.	0,07	0,11	0,42	0,05	0,13	0,50	-0,03	0,10	0,46	**0,52**
*5. Arvan, et kui pole teada, mis ees ootab, tasub eeldada parimat.	0,69	-0,11	0,00	0,08	0,72	-0,05	-0,02	**0,78**	-0,15	0,59
*6. Üldiselt näen asju pigem optimistlikult.	**0,91**	-0,04	-0,01	-0,11	0,84	0,08	-0,15	0,8	-0,06	0,69
7. Arvan, et kõigele leidub lahendus.	0,51	0,27	-0,05	0,07	0,46	0,10	0,25	0,57	0,21	**0,74**
8. Arvan, et kui vaid vastu pidada, siis ükskord läheb ju ikka paremaks.	0,57	0,18	-0,05	0,04	0,52	0,09	0,14	0,60	0,13	**0,68**
9. Arvan, et elu on kõigele vaatamata ilus.	0,55	0,13	0,07	0,02	0,52	0,22	0,03	0,54	0,20	**0,70**
10. Püüan näha asju realistlikult, nii nagu nad on.	-0,01	0,49	0,29	-0,11	-0,11	0,72	0,06	-0,16	**0,78**	0,57
*11. Arvan, et sääsest ei peaks elevanti tegema.	-0,04	-0,12	**0,97**	-0,02	0,12	0,72	-0,21	0,05	0,54	0,55
12. Lepin raskustega oma eesmärkide või ideaalide nimel.	0,01	0,36	0,17	0,16	0,02	0,35	0,31	0,08	0,55	**0,59**
13. Arvan, et kuidagi saan ju ikka alati selle, mida vajan.	0,17	0,28	0,03	0,29	0,2	0,14	0,4	0,33	0,37	**0,66**
*14. Arvan, et see, mis algselt näib halb, osutub sageli siiski heaks.	0,17	-0,26	0,05	**0,79**	0,39	-0,20	0,45	0,56	0,04	0,57

Note. Asterix (*) in front of item indicates those included in PAS8. Highest factor loading of item presented in **bold** print.

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