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The impact of events scale-revised (IES-R): Validation of the Ukrainian version

Liudmyla Krupelnytska [a,*], Nazar Yatsenko [b,1], Vladyslava Keller [a], Olha Morozova-Larina [a]

[a] Department of Psychodiagnostics and Clinical Psychology, Faculty of Psychology, Taras Shevchenko National University of Kyiv, Academician Hlushkov Avenue 2A, 03680 Kyiv, Ukraine
[b] Department of Experimental and Applied Psychology, Faculty of Psychology, Taras Shevchenko National University of Kyiv, Academician Hlushkov Avenue 2A, 03680 Kyiv, Ukraine

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ABSTRACT

Background: The aftermath of warfare in Ukraine has witnessed traumatic experiences emerge as a significant concern. This highlights the need for strengthened secondary prevention strategies targeting trauma and stress-related disorders. Providing mental health professionals with tools to support refugees is crucial. The Impact of Events Scale – Revised (IES-R) stands out as the prevalent early diagnostic and clinical assessment tool for measuring the traumatic stress symptoms. However, this questionnaire has yet to be psychometrically adapted to the Ukrainian linguistic and cultural context.
Objective: This study sought to verify the reliability and validity of the Ukrainian version of the Impact of Events Scale – Revised for adult Ukrainian refugees.
Method: A psychometric evaluation was conducted within broader longitudinal research on refugee mental health. The study incorporated a convenience sample of 584 Ukrainian refugees located in Germany. The Ukrainian IES-R's factorial structure underwent validation using CFA with the DWLS estimator. Internal consistency was ascertained using both Cronbach's α and MacDonald's ω. The convergent and divergent validity of the questionnaire were established through Pearson's correlation coefficient. The DIF analysis evaluated diagnostic disparities between groups of respondents identifying as women and men. The ICC, derived from a two-way mixed ANOVA model, and Pearson's correlation coefficients were employed to gauge the test-retest reliability of the IES-R over an 8-month interval between the two data collection waves.
Results: The Ukrainian version of the IES-R retains a three-factor, classification-free structure, with a modification of item No. 12 being shifted to the Hyperarousal subscale. Confirmatory metrics (CMIN/DF = 2.874, RMSEA = 0.049, SRMR = 0.065, CFI = 0.977, TLI = 0.974) bolster the model's fit. Consistency coefficients (α, ω) for each subscale ranged from 0.75 to 0.84, with the IES-R's overall values being ω = 0.92 and α = 0.91. The IES-R total score and individual factor values displayed significant (moderate to high) correlations with PSS-10 and either weak or inverse correlations with SWLS, TIPI, and ZTPI-S, aligning with expectations. The test-retest measures showed low temporal stability with an ICC of 0.206 for the total score and a moderate correlation ($r = 0.412$, $p < 0.01$), indicating the questionnaire assesses trauma and stressor-related symptoms rather than underlying traits.
Conclusion: The data reveal the IES-R as an efficacious diagnostic tool to discern trauma-induced distress in adult Ukrainian refugees. Given its robust psychometric properties, the IES-R is relevant for screening wartime impact.

1. Introduction

The ongoing conflict in Ukraine has precipitated a multitude of challenges, among which the deterioration of mental health among those affected by the war is particularly significant [1]. A common aftermath of exposure to war events is the onset of post-traumatic stress disorder (PTSD) symptoms. Multiple meta-analyses suggest a propensity toward trauma and stressor-related disorders among war-affected populations: 30 % as reported by Steel et al. [2], 26.5 % by Hoppen et al. [3], 26 % by Morina et al. [4]. Furthermore, Charlson et al. [5] observed that

* Corresponding author.
E-mail addresses: krup_lyudmyla@knu.ua (L. Krupelnytska), nazaryatsenko@knu.ua (N. Yatsenko), morozovalarina@knu.ua (O. Morozova-Larina).
[1] Permanent address: Psychiatric Rehabilitation Department, Kyiv Regional Mental Health Centre, Parkova Street 4, Vorzel, Ukraine

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15.3 % of populations exhibit traumatic stress symptoms at any given point during conflicts.

Notably, in the meta-analysis by Sepahvand et al. [6], the authors emphasize the importance of understanding the context in which a community's traumatic experiences occur, drawing on the case of the Iranian population. Research should consider that the situation among Ukrainian refugees is likely influenced by the unique circumstances of the Russian-Ukrainian war. The mental health repercussions of warfare in Ukraine are well documented [7–9], especially for those directly affected, who exhibit a higher propensity to experience traumatic stress [10]. Screenings of refugees indicate that roughly one-third surpass the diagnostic threshold for PTSD [11]. Moreover, Kurapov et al. [12] have suggested that the impact on Ukrainians' mental health is contingent upon their living conditions, a factor that is of utmost importance when addressing the needs of refugees.

Nevertheless, there remains a risk of secondary or indirect trauma, which can be attributed to the hybrid warfare strategies employed by the Russian occupying forces and the potential for media-induced trauma. This risk persists not only among those uninvolved in the direct hostilities in Ukraine but also among both internally displaced persons and refugees [13]. Accurate diagnosis is pivotal, as it not only identifies individuals suffering from traumatic stress stemming from direct exposure to war but also those experiencing secondary or indirect trauma. As Fino et al. [14] have noted, the significance of exposure to war realities often guides research toward examining pre-migration traumatic experiences in refugee populations. Yet, subsequent traumatic events can influence post-traumatic dynamics to the same extent. An accurate diagnosis becomes foundational for effective secondary prevention of trauma and stressor-related disorders in vulnerable refugee populations. The context of the war trauma experienced by Ukrainians currently remains an unresolved issue, one that might be clarified with the application of suitable diagnostic and screening instruments.

The Impact of Events Scale – Revised (IES-R) is a 22-item self-report questionnaire developed by Weiss and Marmar [15] to measure three PTSD symptom clusters: hyperarousal, intrusion, and avoidance. This questionnaire is widely used for screening trauma-related distress from various origins or types of trauma worldwide [16–20]. It is especially valuable in addressing concerns related to specific age groups [21,22].

Table 1
Psychometric properties of IES-R versions in different languages.

Research	Language	Sample size	Internal Consistency	Factor model fit	Dimensionality
Venta et al., 2023 [25]	Spanish	725	NA	$\chi^2 = 746.70$, $p < 0.0001$, RMSEA = 0.06, CFI = 0.92, TLI = 0.91	Two factors: Intrusion/Hyperarousal, Avoidance
Abas et al., 2023 [26]	Shona	264	α = 0.95, α (H/I) = 0.95, α (A) = 0.76	Factor loadings for Intrusion/Hyperarousal ranging from 0.58 to 0.86, for Avoidance ranging from 0.52 to 0.81.	Two factors: Intrusion/Hyperarousal, Avoidance
Brunet et al., 2003 [27]	French	223	α = 0.93, α (A) = 0.86, α (I) = 0.86, α (H) = 0.81	The three-factor solution, 56 % of the variance explained	Three factors: Avoidance, Intrusion, Hyperarousal
Asukai et al., 2002 [28]	Japanese	658	α (A) = 0.91, α (I) = 0.89, α (H) = 0.86	$\chi^2 = 362.6$, df = 195, $p < 0.001$, RMSEA = 0.063, CFI = 0.988, TLI = 0.986	Three factors: Avoidance, Intrusion, Hyperarousal
Craparo et al., 2013 [29]	Italian	262	α (A) = 0.72, α (I) = 0.78, α (H) = 0.8	$\chi^2 = 95.8$, df = 84, $p = 0.178$, RMSEA = 0.02, CFI = 0.99, NNFI = 0.99	Three factors: Avoidance, Intrusion, Hyperarousal
Sharif Nia et al., 2021 [30]	Persian	250	α (A) = 0.86, α (I) = 0.92, α (H) = 0.87	$\chi^2 = 276.6$, df = 130, $p < 0.001$, RMSEA = 0.067, CFI = 0.948, TLI = 0.949	Three factors: Avoidance, Intrusion, Hyperarousal
Juczyński et al., 2009 [31]	Polish	370	α = 0.92, α (A) = 0.78, α (I) = 0.89, α (H) = 0.85	Factor loadings above 0.40, three-factors model explained 66 % of the variance	Three factors: Avoidance, Intrusion, Hyperarousal
Warsini et al., 2015 [32]	Indonesian	110	α = 0.90, α (A) = 0.75, α (I) = 0.85, α (H) = 0.74	$\chi^2 = 383.3$, $p < 0.0001$, RMSR = 0.085, CFI = 0.805	Three factors: Avoidance, Intrusion, Hyperarousal
Eid et al., 2009 [33]	Norwegian	311	NA	$\chi^2 = 69.8$, df = 6, $p = 0.00$, RMSR = 0.076, CFI = 0.947	Three factors: Avoidance, Intrusion, Hyperarousal
Wu & Chan, 2003 [34]	Chinese	116	α (A) = 0.85, α (I) = 0.89, α (H) = 0.83	NA	Three factors: Avoidance, Intrusion, Hyperarousal
Lim et al., 2009 [35]	Korean	254	α = 0.93	Factor loadings above 0.40, four-factors model explained 68.8 % of the variance	Four factors: Avoidance, Intrusion, Numbness, Hyperarousal
Grassi et al., 2021 [36]	Syrian Arabic	288	ω = 0.80	$\chi^2 = 536.06$, df = 203, $p < 0.001$, RMSEA = 0.076, CFI = 0.824	Four factors: Avoidance/Numbing, Intrusion, Hyperarousal, Sleep Disturbance
Ali et al., 2022 [24]	Arabic	992	α = 0.92, α (A) = 0.82, α (I) = 0.74, α (H) = 0.74, α (N) = 0.68, α (S) = 0.77, α (I/D) = 0.87	$\chi^2 = 930.6$, df = 189, p < 0.001, RMSEA = 0.063, CFI = 0.919, TLI = 0.901	Six factors: Avoidance, Intrusion, Numbing, Hyperarousal, Sleep problems, Irritability/ Dysphoria

Note: This table provides a comparative summary of the psychometric properties of the Impact of Events Scale – Revised (IES-R) as evaluated in different linguistic contexts. The key properties outlined include internal consistency measures, factor model fit indices, and the identified dimensionality or structure of the scale. Internal consistency measures include Cronbach's alpha (α) and McDonald's omega (ω), where provided. The factor model fit indices include chi-square (χ^2) values, degrees of freedom (df), *p*-values, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI), Non-Normed Fit Index (NNFI). The dimensionality section delineates the primary factors identified in the scale for the specified language version.
Abbreviations: A – Avoidance subscale; I – Intrusion subscale; H – Hyperarousal subscale.
Source: Compiled by the authors from a literature review.

Given its broad use, questions regarding the IES-R's classification independence, which refers to the ability of the scale to maintain its factor structure across different populations, have emerged. Changes to the PTSD diagnostic criteria, such as the reclassification of PTSD symptom clusters in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders, have complicated the use of instruments like the IES-R [23]. Such alterations may require the expansion or narrowing of the conceptual framework used in the diagnostic approach. Naturally, this has raised concerns about the questionnaire's dimensionality. Yet, as highlighted by Ali et al. [24], modifications to the factor structure appear inconsistent, and the explanatory power of individual models differs significantly. The authors pinpointed intergroup invariance, the consistency of the factor structure across different groups, as a primary challenge, noting the prevalence of cohort studies that employ specially designed questionnaires for particular issues. This trend is exacerbated by the limited number of cross-cultural validation efforts. Adapting a method to a specific context often entails adjustments to its factor structure, as illustrated in Table 1.

The three-factor structure generally fits the data well, yet alternative models are also compelling [23]. Thus, the central concern isn't merely the quality of the questionnaire version but achieving methodological consensus. Specifically, the revision of the International Classification of Diseases and Conditions has simplified differentiation criteria for PTSD. Although the distribution of the questionnaire was halted by its creator following the new edition of the Diagnostic and Statistical Manual of Mental Disorders, the unidimensional measure of PTSD as per the IES-R might offer enhanced screening precision by reducing the complexity of scoring and interpretation [37]. Chiasson et al. [38] emphasize the importance of prioritizing symptom severity over frequency, suggesting that this approach allows for a more consistent assessment of post-traumatic stress symptoms, irrespective of the classification system in use. This notion is further supported by Hosey et al. [39], who highlighted the consistency of the PTSD phenotype despite changes in the diagnostic approach. According to their commentary, the IES-R stands as a viable alternative to composing a new tool [40]. Notably, the simplified model of post-traumatic stress disorder was trialed among Ukrainian internally displaced persons and proved especially effective in identifying clinically significant symptom disclosures [41]. The ongoing wartime realities in Ukraine have amplified the demand for this scale in clinical practice and screening. In the presented work, the IES-R was chosen as a tool for validation, aligning with the perspective of criteria-free diagnosis while also acknowledging the prevalence of this tool in studies focused on the Ukrainian sample.

This translated version has been employed in various projects, inclusive of the present longitudinal study. As of October 2023, the authors' translation of the IES-R stands as one of the widely utilized tools within this research domain of Ukrainian projects. Despite its widespread use, a notable gap exists in the literature concerning its psychometric validation. Given the significant traumatic impact on the Ukrainian population and the lack of comprehensive data on the Ukrainian-language versions of the IES-R, concerns regarding data quality and implementation persist. This underscores a pressing need for a thorough understanding of the scale's quality and inherent limitations. The primary objective of this study is to validate the Ukrainian version of the Impact of Events Scale – Revised among adult Ukrainian refugees.

2. Research methodology

2.1. Translation and adaptation

The translation of the scale was conducted following Brislin's translation model and has been previously reported by Rodríguez-Muñoz et al. [42]. In the initial phase, the IES-R scale was translated and then back-translated to ensure accuracy. Next, the final translation was rigorously evaluated by experts for consistency and precision, with a focus on maintaining similarity in meaning and linguistic clarity within the instructions, items, and response format. This process ensured the conceptual, semantic, and content equivalence of the items.

Subsequently, a preliminary testing phase was carried out to further assess the adequacy of the content and clarity of expression. This phase involved a pilot study with 32 participants from the Ukrainian population, which provided feedback on the translation's effectiveness and comprehensibility.

2.2. Participants

Convenience sampling was employed to recruit the Ukrainian refugee population through social networks and face-to-face meetings using Tivian Unipark. Data were collected from 584 participants, comprising 71 individuals identifying as men and 513 identifying as women. Respondents aged 18 and above had lived in Ukraine until February 2022. The survey, which is part of a broader project [43], commenced on September 21, 2022 and was conducted in eight waves. For this paper, only data from two collection waves were included: the first, which lasted until November 30, and the final wave, which concluded on May 30. Following the initial data collection, there was a three-month period of active questionnaire distribution, then a three-month pause, leading to the final round of data collection. By the last days of May 2023, all pertinent data from these selected waves was collated and ready for further analysis.

Before completing the test battery, respondents were acquainted with a digital consent form, which delineated the study's purpose, conditions for data preservation, processing, and protection, ensuring voluntary participation and confidentiality of the responses provided.

2.3. Measures

2.3.1. The impact of events scale – Revised (IES-R)

The Impact of Events Scale – Revised (IES-R) consists of 22 self-report items designed to assess distress associated with a specific event [15]. For Ukrainian refugees, the traumatic event refers to active hostilities in Ukraine, which pose life-threatening situations. Respondents rate statements on a five-point Likert scale, ranging from 1 *"Did not bother at all"* to 5 *"Bothered very much."* A score of 30 out of a possible 110 indicates the presence of significant traumatic stress symptoms and suggests a high probability of trauma and stressor-related disorders. The scale is divided into three subscales that correspond to the PTSD symptom clusters outlined in the the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders:

- Hyperarousal, which includes 6 items, e.g., *"I was jumpy and easily startled."* The Ukrainian-adapted version of this subscale contains 7 items, including item No. 12.
- Intrusion, which includes 8 items, e.g., *"I had waves of strong feelings about it."*
- Avoidance, which includes 8 items, e.g., *"I stayed away from reminders of it."* The Ukrainian-adapted version of this subscale contains 7 items, with item No. 12 excluded.

2.3.2. The Posttraumatic Symptom Scale (PSS-10)

The Posttraumatic Symptom Scale (PSS-10) contains 10 items to evaluate the probability of PTSD. In this study, it was used to ascertain the convergent validity of the IES-R [44]. This modified version [45] uses a seven-point Likert scale for each statement, e.g., *"Fears when approaching the place of the accident or situations that remind me of it,"* with responses from 1 *"No concerns"* to 7 *"Very serious concerns."* The Ukrainian adaptation of this scale was provided by Veldbrekht and Tavrovetska [46], demonstrating reliable psychometric properties ($\alpha = 0.84$, factor loadings above 0.43, and 53.91 % of variance explained). Preliminary data from this study indicate high internal consistency ($\alpha = 0.90$, 90 % CI: [0.89; 0.91], $r = 0.47$). Although the high average r value suggests the potential redundancy, item revisions does not lower the

average r [47]. Instead, it results in a decrease in Cronbach's α. For instance, removing Item No. 3 (*"I feel dejected, down-trodden"*), that had highest inter-item correlations values, was not effective, as it pertains to affective disparities – an important but distinct aspect of traumatic stress often related to other symptoms. Similarly, removing Item No. 2 (*"Nightmares about traumatic events"*) was unsuccessful in improving the model, as this item relates to the intrusive component of traumatic stress, a critical and separate dimension of such experiences ($u_2 = 0.77$, $h_2 = 0.23$). This suggests that the items in the PSS-10 are not overly redundant. High redundancy would typically be indicated by a significant drop in average rr when an item is removed, which is not observed here. The fact that removing any item lowers Cronbach's α indicates that each item contributes positively to the overall internal consistency of the scale. In other words, all items are functioning cohesively to measure the underlying construct.

2.3.3. The ten-item personality inventory (TIPI)

The Ten-Item Personality Inventory (TIPI) [48] is designed to assess personality traits according to the Five-Factor Model [49]. In this study, the TIPI was utilized to evaluate the divergent validity of the IES-R. Participants rated items prefixed with *"I see myself as…,"* such as "Reserved, quiet," on a seven-point Likert scale ranging from 1 *"Disagree strongly"* to 7 *"Agree strongly"*. The Ukrainian adaptation by Klimanska and Haletska [50] demonstrated high internal consistency (ω = 0.87) within our sample. However, the context of the refugee sample requires a revision of the factor structure.

In our analysis, the Kaiser-Meyer-Olkin (KMO) measure for 6 out of 10 items was below 0.7, with parallel analysis indicating a four-factor model with three components. A Confirmatory Factor Analysis (CFA) using Diagonally Weighted Least Squares (DWLS) yielded the following fit indices: RMSEA = 0.119 (90 % CI: [0.105; 0.134]), CFI = 0.882, TLI = 0.788, SRMR = 0.097. Additionally, significant multicollinearity was observed among all subscales except Openness, with correlations ranging from $r = 0.44$ between Agreeableness and Extraversion to $r = 1.00$ between Stability and Conscientiousness. These findings suggest that discussed factors may not be distinct in this sample. The TIPI might be more reflective of prosocial tendencies rather than separate personality dimensions. This hypothesis is supported by a revised factor structure that identifies two distinct factors: social desirability (Items No. 1, 3, 7) and nonconformity (Items No. 2, 5, 9). The revised model exhibited improved fit indices: RMSEA = 0.099 (90 % CI: [0.074; 0.125]), CFI = 0.953, TLI = 0.912, SRMR = 0.043, with factor loadings above 0.48. The model comparison indicated a significant improvement, $\Delta\chi^2(17) = 208.73$, $p < 0.001$, RMSEA = 0.1403.

2.3.4. The satisfaction with life scale (SWLS)

The Satisfaction With Life Scale, SWLS [51], comprises five items that assess respondents' overall cognitive judgments of life satisfaction, excluding emotional aspects. We posit that a correlational analysis of IES-R and SWLS scores is necessary to substantiate the construct validity of the questionnaire. Extant literature indicates that perceived life satisfaction should exhibit a negative relationship with traumatic stress manifestations, as measured by the IES-R [12]. This scale requires participants to indicate their agreement with each item, e.g., *"So far I have gotten the important things I want in life,"* using a seven-point Likert scale from 7 *"Strongly disagree"* to 1 *"Strongly agree."* There are no prior publications focused specifically on the adaptation process for the Ukrainian version of the scale. However, Semkiv's translation of the scale is consistently used in Ukrainian publications, with confirmed relevant psychometric properties (α = 0.78) [52]. The results obtained in the current study reflect acceptable qualities of the used scale translation (α = 0.75, 90 % CI: [0.72; 0.78], $r = 0.38$).

2.3.5. The Zimbardo time perspective inventory – Short (ZTPI-S)

The Zimbardo Time Perspective Inventory – Short, ZTPI-S [53] is a condensed version of the original instrument by Zimbardo and Boyd [54]. This instrument, like the SWLS, was used to verify the construct validity of the IES-R.

It features 18 items spread across six subscales, each encompassing three core statements.

- Negative past, e.g., *"I often think of what I should have done differently in my life."*
- Positive past, e.g., *"Familiar childhood sights, sounds, smells often bring back a flood of wonderful memories."*
- Fatalistic present, e.g., *"My life path is controlled by forces I cannot influence."*
- Hedonistic present, e.g., *"I find myself getting swept up in the excitement of the moment."*
- Positive future, e.g., *"When I want to achieve something, I set goals and consider specific means for reaching those goals."*
- Negative future, e.g., *"It doesn't make sense to worry about the future, since there is nothing that I can do about it anyway."*

The Ukrainian adaptation of this scale was provided by Senyk and demonstrated high consistency, with α values ranging from 0.69 to 0.82. Retest reliability showed r values ranging from 0.82 to 0.87 over 4 weeks and from 0.83 to 0.91 over 2 weeks. The model fit was acceptable (RMSEA = 0.049, CFI = 0.740, and factor loadings above 0.3) [55]. Current metrics also indicate an acceptable model fit (ω = 0.88, RMSEA = 0.053 (90 % CI: [0.046; 0.060]), CFI = 0.960, TLI = 0.949, SRMR = 0.061).

2.4. Data analysis

The analysis of the collected data was executed using RStudio (version 2023.06.0 + 421) for macOS Sonoma 14.0. A Confirmatory Factor Analysis (CFA) was employed to evaluate the adequacy of the Ukrainian IES-R model. In conducting this, both the Maximum Likelihood (ML) method and the Diagonally Weighted Least Squares (DWLS) estimators were utilized. Essential fit indicators included the Standardized Root Mean Square Residual (SRMR), the Goodness of Fit Index (GFI), the Comparative Fit Index (CFI), the Tucker-Lewis index (TLI), and the Root Mean Square Error of Approximation (RMSEA). Internal coherence was assessed through Cronbach's α and MacDonald's ω. The convergent and discriminant veracity of the instrument were validated using Pearson's correlation coefficient. The Differential Item Functioning (DIF) was assessed using ordinal regression modeling across two gender groups. Test-retest reliability was assessed using both the Intraclass Correlation Coefficient (ICC) and Pearson's correlation indices. The ICC was derived from variance components obtained through a two-way mixed ANOVA model.

2.5. Ethics

The study design was approved by the University of Bayreuth ethics committee (Approval No. 22–2022 dated 08/24/2022). The security precautions pertaining to confidentiality, anonymity, and data management for participants have been authorized. The participants of the study were provided with a full grasp of the terms related to data storage, utilization, and safeguarding, and afterwards provided their informed consent accordingly.

3. Results

3.1. Factor structure

Based on the results from the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO), the Measure of Sampling Adequacy (MSA) for the Ukrainian version of the Impact of Events Scale – Revised ranged between 0.83 and 0.97, yielding an overall score of 0.93. Parallel analysis suggested four factors and three components. Fig. 1 offers a

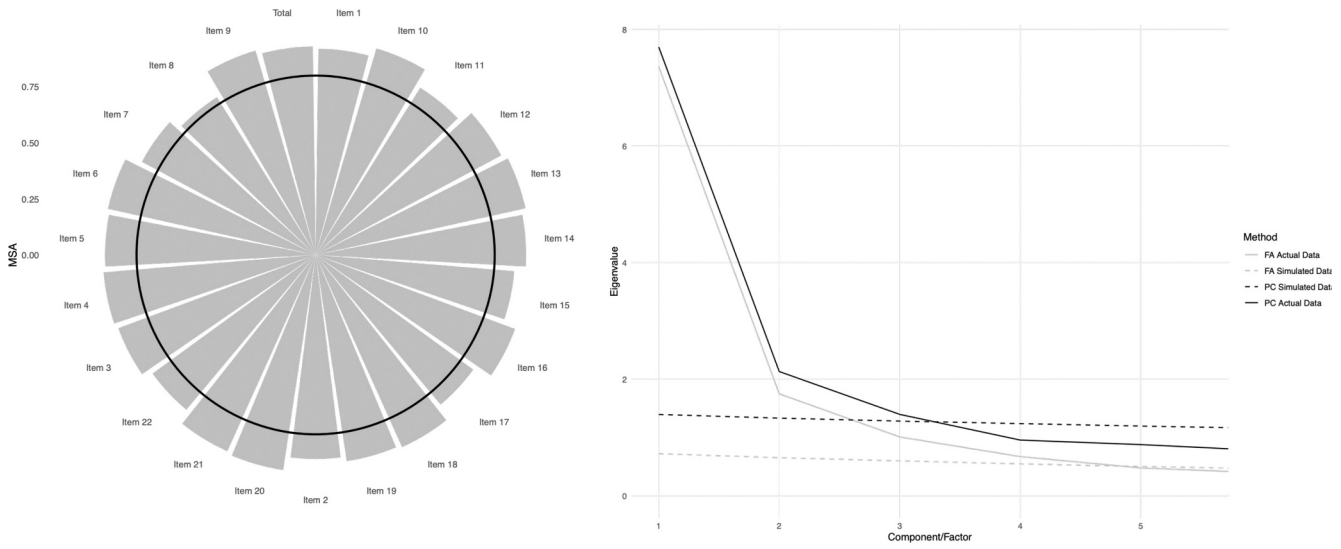

Fig. 1. Scree Plot and Measure of Sampling Adequacy (MSA) Distribution Visualization.
Note: The left side of the figure presents a polar plot, illustrating the Measure of Sampling Adequacy (MSA) for each item of the Ukrainian version of the IES-R, with a solid black line indicating the recommended MSA threshold of 0.8. On the right, the Scree plot depicts the eigenvalues, aiding in the determination of how many components or factors to retain in the analysis. Scree plot conducted based on the results of factor analysis (FA) and principal component analysis (PC).
Source: Data derived from the authors' factorability analysis results.

visualization of preliminary analysis on the IES-R's factorability.

Given the ordinal nature from the Likert scale evaluation, ranging from 1 to 5, the Diagonally Weighted Least Squares (DWLS) estimator was used in the Confirmatory Factor Analysis to assess the factor model fit. Verifying equal intervals between respondent ratings presents challenges, hence the data is not considered continuous. Moreover, the assumption of multivariate normality is not ensured in this context. These findings confirm the reliability of the Ukrainian IES-R factor structure, particularly given the ordinal nature of the collected data.

In a prior CFA analysis with Maximum Likelihood estimation and Robust standard errors (MLR), the correlated three-factor model did not adequately fit the data. The measures were as follows: RMSEA = 0.089 (90 % CI: [0.084; 0.094]), Robust RMSEA = 0.088 (90 % CI: [0.084; 0.094]), CFI = 0.805, TLI = 0.781, Robust CFI = 0.808, and Robust TLI = 0.785, with an SRMR of 0.076. Adjustments using the Huber-White (or "sandwich") standard errors approach didn't prove beneficial. This emphasizes the ordinal nature of the Likert scale ratings, which de-emphasizes the need for normality for the given dataset.

According to the results from CFA employing the DWLS estimator, the specified model demonstrated an adequate fit to the data: RMSEA = 0.059 (90 % CI: [0.053; 0.064]), CFI = 0.967, TLI = 0.963, and SRMR = 0.072. The only adjustment implemented involved relocating IES-R item No. 12, *"I was aware that I still had a lot of feelings about it, but I didn't deal with them,"* to the Hyperarousal subscale. The decision to shift item No. 12 was informed by modification indices of 118.32 for the Hyperarousal subscale and 114.04 for the Intrusion subscale. This adjustment arises from linguistic differences in the Ukrainian version. Specifically, the phrase *"still had a lot of feelings"* is translated into Ukrainian as *"overflow,"* which conveys a sense of being overwhelmed by emotions. Similarly, the phrase *"didn't deal"* was translated as *"couldn't deal,"* altering the strength of the item. This change shifts the emphasis from the diversity or quantity of emotions related to the event, as expressed in the English version, to a heightened emotional state or tension. Consequently, this is more appropriately categorized under Hyperarousal rather than Intrusion.

With this adjustment, the correlated three-factor model showed improved fit: RMSEA = 0.049 (90 % CI: [0.044; 0.055]), CFI = 0.977, TLI = 0.974, SRMR = 0.065. The modification indices for items No. 8 and No. 13 were 40.39 and 83.35 for the Intrusion subscale, and 41.35 and 89.25 for the Hyperarousal subscale. However, subsequent revisions to the factor structure decreased the model's fit to the data. Therefore, considering the content of the statements: *"I stayed away from reminders of it"* (Item No. 8) and *"My feelings about it were kind of numb"* (Item No. 13), seven items of the Avoidance subscale were retained. This suggests potential limitations in measuring Avoidance among refugees during this phase of hostilities in Ukraine. Generally, the factor loadings for the final model were significant ($p < 0.001$), ranging from 0.43 to 0.76.

The covariances between the latent factors were all statistically significant ($p < 0.001$). The covariance between Intrusion and Hyperarousal was particularly notable at 0.374, indicating that increases in Intrusion symptoms are closely associated with increases in Hyperarousal symptoms, and vice versa. This finding reflects a strong connection between these two symptom clusters within the context of traumatic stress, as highlighted in previous studies [56,57]. The covariances involving the Avoidance factor were also significant, with moderate estimates: 0.208 for its relation with Intrusion and 0.235 with Hyperarousal. Although these covariances indicate meaningful relationships, the moderate values suggest that while these factors are interrelated, they remain distinct constructs.This confirms the validity of the three-factor model in the Ukrainian version of the IES-R, as shown in Table 2.

3.2. Internal consistency

The total IES-R showed *excellent* reliability with an internal consistency of 0.91, as measured using Cronbach's α [58]. The α values for the subscales were as follows: Intrusion (0.84), Avoidance (0.75), and Hyperarousal (0.83). Overall, the internal consistency of the subscales was deemed *acceptable*. However, based on the recommendations of Cho [59] and McNeish [60], McDonald's ω [61] is preferred over Cronbach's α, particularly regarding the tau-equivalence requirement. As the Ukrainian version of the IES-R doesn't meet the tau-equivalence assumption, ω values were also calculated. The overall IES-R ω value was 0.92, indicating *robust* reliability, while the subscale values also denoted *acceptable* reliability: Intrusion (0.84), Avoidance (0.75), and Hyperarousal (0.84). The data suggest the presence of both a common underlying factor and individual factors contributing to the differentiation of symptom clusters. These values underscore the importance of specific factors in understanding the data structure, as a single general factor doesn't account for all the data variance. Notably, 64 % of the

Table 2
Factor structure of the Ukrainian version of the impact of events scale – revised.

Item No.	Item (Ukrainian)	Item (English)	Std. Factor Loading	Mean (SD)
Avoidance				
13	Мої почуття з цього приводу були наче заціпеніліМи.	My feelings about it were kind of numb.	0.72	2.92 (1.00)
11	Я наМагався (наМагалась) не дуМати про це.	I tried not to think about it.	0.63	2.76 (1.09)
5	Я наМагався (наМагалась) не дозволяти собі засМучуватися, коли дуМав (дуМала) про це або Мені про це нагадували.	I avoided letting myself get upset when I thought about it or was reminded of it.	0.55	3.00 (0.96)
17	Я наМагався (наМагалась) стерти ці події з паМ'яті.	I tried to remove it from my memory.	0.50	2.49 (1.08)
8	Я наМагався (наМагалась) уникати нагадувань про це.	I stayed away from reminders of it.	0.46	2.71 (1.08)
7	В Мене траплялось відчуття, ніби цього взагалі не було або було не насправді.	I felt as if it hadn't happened or wasn't real.	0.45	2.79 (1.18)
22	Я наМагався (наМагалась) не говорити про це.	I tried not to talk about it.	0.43	2.45 (1.09)
Intrusion				
14	Я поМітив (поМітила), що дію або відчуваю себе, наче повернувся (повернулась) у той час.	I found myself acting or feeling like I was back at that time.	0.76	2.52 (1.04)
16	Сильні почуття щодо цього хвиляМи накочувались на Мене.	I had waves of strong feelings about it.	0.76	3.00 (1.12)
9	Картини пережитого поставали у Моїх дуМках.	Pictures about it popped into my mind.	0.70	3.14 (1.06)
2	Я погано спав (спала).	I had trouble staying asleep.	0.69	3.18 (1.04)
3	Сторонні речі зМушували Мене дуМати про це.	Other things kept making me think about it.	0.68	3.17 (1.00)
1	Будь-яке нагадування повертало почуття щодо цього.	Any reminder brought back feelings about it.	0.62	3.31 (1.01)
6	Я дуМав (дуМала) про це, коли не збирався (збиралась) цього робити	I thought about it when I didn't mean to.	0.62	3.13 (1.01)
20	Мені снилися ці події.	I had dreams about it.	0.56	2.64 (1.13)
Hyperarousal				
10	Я був (була) знервованиМ (знервованою) і легко лякався (лякалась).	I was jumpy and easily startled.	0.72	3.01 (1.10)
18	У Мене були проблеМи з концентрацією уваги.	I had trouble concentrating.	0.64	2.82 (1.09)
21	Я відчував (відчувала) себе обереЖниМ (обереЖною) та пильниМ (пильною).	I felt watchful and on-guard.	0.58	2.86 (1.12)
4	Я відчував (відчувала) роздратування та злість.	I felt irritable and angry.	0.57	3.25 (1.08)
19	Нагадування про ці події викликало у Мене фізичні реакції, такі як потіння, проблеМи з диханняМ, нудота або сильне серцебиття.	Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart.	0.55	2.60 (1.09)
15	Мені було ваЖко засинати.	I had trouble falling asleep.	0.53	2.93 (1.16)
12	Я усвідоМлював (усвідоМлювала), що почуття щодо цього все ще переповнюють Мене, але нічого не Міг (не Могла) вдіяти з ниМи.	I was aware that I still had a lot of feelings about it, but I didn't deal with them.	0.71	3.24 (1.02)

The item was reallocated from the Avoidance subscale to the Hyperarousal subscale

Note: This table presents the results of the Confirmatory Factor Analysis (CFA) on the IES-R. Each item from the IES-R is represented with its respective number, the Ukrainian and English phrasing, the standardized factor loading from the CFA, and the mean score with standard deviation (SD) from the sample. The items are grouped under their respective factors: Avoidance, Intrusion, and Hyperarousal. Notably, Item No. 12 was shifted from the Avoidance to the Hyperarousal subscale, based on the linguistic nuances and resulting model fit in the Ukrainian context.
Source: Data derived from the authors' CFA results.

total variance ($\omega_h = 0.64$) is explained by the general distress factor. The convergence of both α and ω totals in this study suggests a balanced contribution of the elements to their respective factors. This not only strengthens the understanding of the instrument's structure but also aligns with the findings of Malkewitz et al. [62].

3.3. Convergent and divergent validity

Based on Pearson's correlation analysis results, the IES-R total score and its subscales showed strong positive correlations with the PSS-10 score, with r values ranging between 0.4 and 0.64 ($p < 0.001$). This supports the convergent validity of the questionnaire, given that both scales assess traumatic stress symptoms. Visualization of the distribution is presented in Fig. 2.

Furthermore, the IES-R total score demonstrated a robust negative correlation ($r = -0.93$, $p < 0.001$) with SWLS score, underlining convergent validity. This is consistent with the SWLS's focus on cognitive representations of life satisfaction, which are anticipated to be inversely correlated with trauma-induced distress level. The weak associations between the SWLS scores and the Avoidance and Hyperarousal subscales ($p > 0.05$) further emphasize that these IES-R subscales aren't primarily assessing facets tied to perceived life satisfaction. However, the connection between the SWLS score and Intrusion underscores ($r = -0.83$, $p < 0.05$) the significance of intrusion in the disruption of an individual's sense of well-being. The intrusive thoughts and overarching distress from trauma might likely erode respondents' perceptions of life enjoyment.

The IES-R further exhibits divergent validity for most personality traits, as anticipated. For instance, Conscientiousness has a moderate positive correlation with Avoidance and a weak correlation with other subscales. It can serve as a foundation for elaborating on the personal predictors of Ukrainian refugee distress. Extraversion, Stability, and Agreeableness show weak correlations, while Openness reveals weak or nonsignificant correlations with all IES-R subscales. This indicates that these personality constructs are not intrinsically linked to the IES-R subscales, further supporting the questionnaire's divergent validity. It's notable that the moderate association of Agreeableness and Conscientiousness with Avoidance, combined with the subscale's lower factor loadings, underscores the complexity of this symptom cluster. Such intricacies, especially within the context of assessing refugees from Ukraine, warrant further scrutiny.

The IES-R demonstrated varying degrees of correlation with the ZTPI scales. Specifically, the total score exhibited moderate positive correlations with the Future-Negative ($r = 0.43$, $p < 0.001$), Past-Negative ($r = 0.44$, $p < 0.001$), and Present-Fatalistic scales ($r = 0.26$, $p < 0.001$). Additionally, moderate positive correlations were observed between the

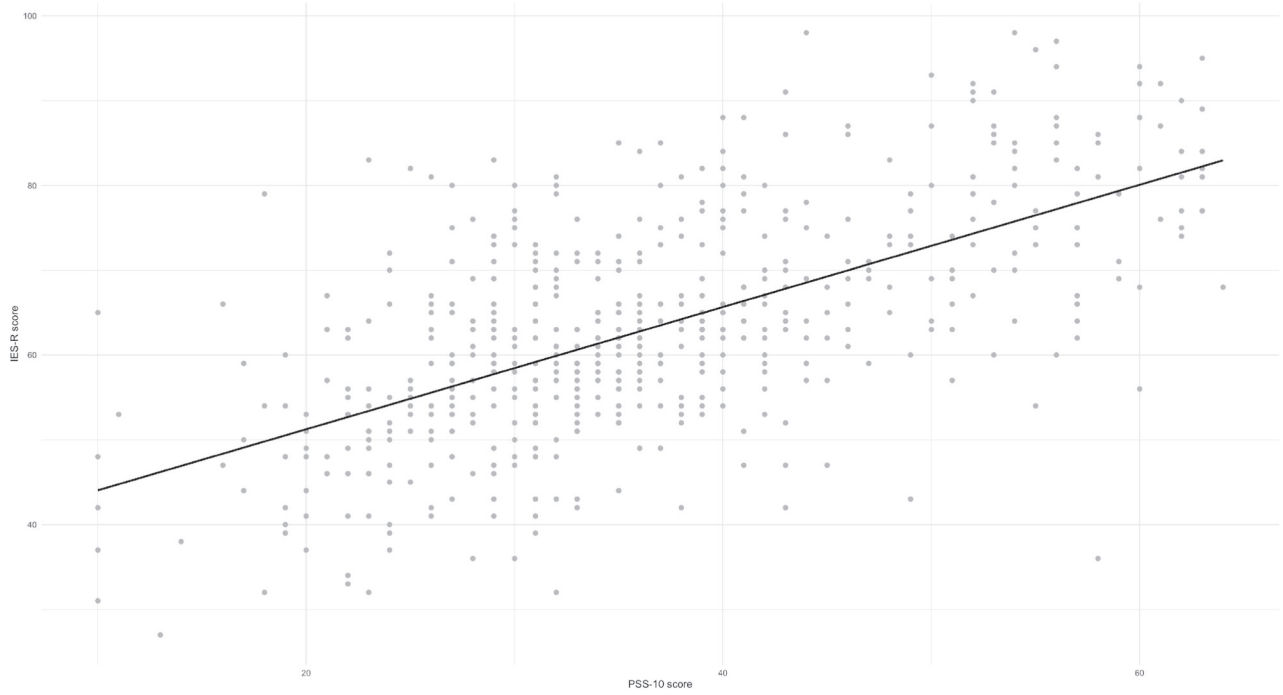

Fig. 2. Scatterplot of IES-R Scores Against PSS-10 Scores with a Linear Regression Line.
Source: Visualization of data derived from authors' linear regression modeling results.

IES-R subscales – Intrusion, Avoidance, and Hyperarousal – and the aforementioned ZTPI scales. These correlations bolster the argument for convergent validity, as they encapsulate a negative portrayal of an individual's lifetime experiences.

Simultaneously, low correlations were observed between the IES-R scores and the positive facets of time perspective, specifically the Future-Positive, Past-Positive, and Present-Hedonistic subscales. The consistent difference in the strength of relations between the IES-R and the negative facets, as compared to the positive ones, may serve as evidence for the divergent validity of the questionnaire. It's plausible that while trauma and stressor-related symptoms correlate with negative facets of temporal perspective, they don't negate the presence of positive ones. One could posit that the IES-R assesses distressing perceptions of life events, while the ZTPI scales generally capture these perceptions. Thus, despite their contrasting valances, both scales are oriented toward life events. This makes their correlations (Table 3) indicative of convergent validity.

3.4. Differential item functioning (DIF)

Prior qualitative research has suggested that there are gender-based variations in trauma experience, which require further clarification [63]. First et al. [64] highlighted that individuals with masculine identity socialization experience typically exhibit a more pronounced manifestation of traumatic stress than those with a feminine identity socialization experience to achieve equivalent scale scores. In the analyzed dataset, the number of responses from participants identifying as women ($n = 511$) outnumbered those identifying as men ($n = 71$). To address potential Differential Item Functioning, a gender-matched analysis was conducted. From the dataset, a subset of 142 responses was selected for analysis through propensity score matching, utilizing the nearest neighbor method, stratified by indicated gender. Gender invariances in the context of gender diversity were not investigated, as respondents did not identify themselves as related to non-binary, gender fluid, or genderqueer identities. Future research should detail the examination of the psychometric functioning of the Ukrainian Version of

Table 3
Correlation indices of the Ukrainian version of the IES-R with other variables.

Variables	IES-R total score	Intrusion	Avoidance	Hyperarousal
	r (p), values			
PSS-10	0.64 (<0.001)	0.63 (<0.001)	0.40 (<0.001)	0.642 (<0.001)
SWLS	−0.93 (<0.001)	−0.83 (<0.05)	−0.08 (>0.05)	−0.08 (>0.05)
Conscientiousness	0.19 (<0.001)	0.23 (<0.001)	0.82 (<0.05)	0.17 (<0.001)
Extraversion	−0.18 (<0.001)	−0.08 (>0.05)	−0.10 (<0.05)	−0.08 (>0.05)
Agreeableness	0.16 (<0.001)	0.22 (<0.001)	0.50 (>0.05)	0.14 (<0.001)
Stability	−0.10 (<0.05)	−0.19 (<0.001)	−0.05 (>0.05)	−0.24 (<0.001)
Openness	0.05 (>0.05)	0.09 (<0.05)	0.00 (>0.05)	0.03 (>0.05)
Future-Negative	0.43 (<0.001)	0.25 (<0.001)	0.32 (<0.001)	0.41 (<0.001)
Future-Positive	0.23 (<0.001)	0.40 (<0.001)	0.13 (<0.01)	0.22 (<0.001)
Past-Negative	0.44 (<0.001)	0.44 (<0.001)	0.31 (<0.001)	0.40 (<0.001)
Past-Positive	0.20 (<0.001)	0.28 (<0.001)	0.04 (>0.05)	0.21 (<0.001)
Present-Fatalistic	0.26 (<0.001)	0.18 (<0.001)	0.27 (<0.001)	0.24 (<0.001)
Present-Hedonistic	0.15 (<0.001)	0.12 (<0.01)	0.11 (<0.01)	0.18 (<0.001)

Note: This table presents Pearson's correlation coefficients between the IES-R total score and its subscales (Intrusion, Avoidance, Hyperarousal) with various other measured variables. Each row represents a different variable, and the corresponding correlation values (r) are provided, with the associated significance level (p) in parentheses.
Source: Analysis conducted by the authors using Pearson's correlation analysis.

the Impact of Event Scale-Revised among gender-diverse individuals.

The model factored in indicators such as self-reported distress post-trauma and Extraversion. The latter served as a criterion to equate different groups of respondents in terms of their likelihood to genuinely report their conditions. The association of Extraversion with emotional quotient [65] justifies its use as a metric for response tendencies. This rationale is reinforced by studies suggesting extraverted men are more inclined toward help-seeking behavior [66]. Regarding the questionnaire's validity, most items demonstrated consistent functionality across genders, even after accounting for covariates like age, extraversion, and post-event distress magnitude.

Distinct gender-based variations were observed in the statement: *"I felt as if it hadn't happened or wasn't real"* (Item No. 7) in relation to distress levels. With a DIF estimate of 0.11 ($p < 0.05$), a positive value suggests that women (coded as 1), when assessed for equivalent levels, tend to score higher on this item than men (coded as 0). This suggests women might align more with this statement than men, perhaps finding the distress aspect it touches on more relatable.

Conversely, for the statement: *"I found myself acting or feeling like I was back at that time"* (Item No. 14), the Extraversion-based DIF estimate is −0.43 ($p < 0.01$). A negative score suggests that women, for an equivalent level of extraversion, score lower on this item than men. Men, with extraversion levels mirroring those of women, appear more amenable to this statement. The possibility is hinted that the item captures a trauma facet more acknowledged or resonant with men than women. A detailed exposition of these findings can be found in Table 4.

3.5. Test-retest reliability

The temporal stability of diagnostic results was assessed from a subset of 91 participants. By the end of the longitudinal study, they were re-evaluated using the Ukrainian version of the IES-R. When merging datasets, participants without a unique identifier were omitted. Consequently, the final sample comprised 78 individuals who had completed the questionnaire at two distinct time points: September 2022 (first wave) and May 2023 (second wave). Given the prolonged interval between the assessments, both Intraclass Correlation Coefficients (ICC) and Pearson's correlation coefficients were utilized, with the expectation that the correlation indices would surpass the ICC values. To compute the ICC, variance figures were derived from a two-way mixed ANOVA model, consistent with the agreement definition by Koo & Li [67].

Additionally, the internal consistency of the data from the second collection wave was ascertained using both Cronbach's α and McDonald's ω. The results highlighted *excellent* consistency for the overall IES-R score (α = 0.94, ω = 0.95). Notably, the α and ω values were congruent for the subscales: Intrusion (0.81), Avoidance (0.82), and Hyperarousal (0.88). A significant correlation also persisted between the respondents' total scores on the IES-R and PSS-10 ($r = 0.66$, $p < 0.001$), aligning with earlier data.

The obtained ICC values, specifically 0.206 for the IES-R total score, 0.257 for Intrusion, and 0.302 for the Hyperarousal subscale, underscore discrepancies in evaluations based on these criteria across both phases of the study. Concurrently, the ICC value of 0.088 for Avoidance suggests a potential requirement to re-evaluate or elucidate the majority of items on this scale. Such values would be inadequate to attest to the test-retest reliability of the questionnaire within a conventional 2-week test-retest interval. Nonetheless, given the span of 8 months between assessments, it is plausible to contend that these variances are not solely attributable to the measurement characteristics of the Ukrainian version of the IES-R. Indeed, during attempts at linear modeling with mixed effects, a marginal (singular) fit for the IES-R model was identified. This highlights challenges in estimating the variance components of random effects. In this context, the minimal between-subject variance relative to the residual variance could account for the observed low ICC values.

The observed moderate correlation for the IES-R total score ($r = 0.412$, $p < 0.01$) indicates a linear relationship between the test scores at the two assessment points. While this correlation demonstrates some degree of consistency over time, the variances in scores are notable. When evaluated alongside the modeling results, it appears that the Ukrainian version of the IES-R is attuned to capture manifestations of PTSD symptoms. This contrasts with the notion of it gauging enduring, related traits, which would typically exhibit greater temporal stability.

Variations in the consistency metrics across individual items and subscales suggest differential temporal stability of specific facets, leading to the observed heterogeneity. For instance, item No. 5, *"I avoided letting myself get upset when I thought about it or was reminded of it,"* yields a negative ICC of −0.039 and an insignificant Pearson's r ($r = -0.063$, $p > 0.05$). Item No. 22, *"I tried not to talk about it,"* exhibits a similar trend with an ICC of −0.14 and a correlation coefficient of $r = -0.17$ ($p > 0.05$). These items might be more pertinent for gauging experiences proximate to wartime exposure events. In contrast, item No. 21, "I felt watchful and on-guard," exhibits a robust ICC of 0.388 and a significant Pearson's r ($r = 0.506$, $p < 0.001$). This suggests that responses to this item are consistently reported and likely represent a persistent trait or experience over extended periods. Detailed metrics for individual items and scales can be found in Table 5.

An examination of the Bland-Altman plot (Fig. 3) reveals that a majority of data points are encompassed within the Limits of Agreement, though there are noticeable outliers. For the vast majority of participants, the differences between the two survey waves lie within the

Table 4
Results of Differential Item Functioning (DIF) for IES-R Items.

Item No.	IES-R: Gender	Age: Gender	Extraversion: Gender	Item No.	IES-R: Gender	Age: Gender	Extraversion: Gender
	Estimate (p), values				Estimate (p), values		
1	0.04 (0.37)	0.15 (0.69)	−0.02 (0.86)	12	−0.07 (0.14)	-0.087 (0.82)	0.08 (0.55)
2	0.10 (0.06)	-0.32 (0.42)	−0.02 (0.88)	13	−0.01 (0.87)	0.03 (0.94)	0.26 (0.05)
3	−0.03 (0.45)	0.09 (0.82)	−0.08 (0.54)	14	0.05 (0.19)	0.68 (0.08)	−0.43 (0.00)
4	0.01 (0.80)	−0.00 (0.99)	−0.18 (0.18)	15	−0.02 (0.70)	-0.01 (0.98)	0.05 (0.72)
5	0.01 (0.77)	0.36 (0.34)	−0.04 (0.75)	16	−0.07 (0.10)	0.14 (0.71)	0.21 (0.11)
6	−0.01 (0.78)	-0.08 (0.82)	0.13 (0.35)	17	0.04 (0.28)	0.30 (0.44)	0.02 (0.89)
7	0.10 (0.01)	-0.14 (0.69)	−0.05 (0.69)	18	−0.018 (0.66)	0.40 (0.29)	0.23 (0.10)
8	0.01 (0.75)	-0.39 (0.32)	0.02 (0.89)	19	0.04 (0.37)	-0.15 (0.69)	−0.03 (0.79)
9	0.01 (0.76)	0.40 (0.31)	0.13 (0.33)	20	0.04 (0.32)	-0.32 (0.41)	−0.05 (0.70)
10	0.05 (0.37)	0.01 (0.97)	−0.06 (0.63)	21	0.013 (0.80)	0.06 (0.86)	−0.14 (0.31)
11	0.09 (0.05)	-0.11 (0.78)	0.12 (0.35)	22	−0.05 (0.16)	-0.46 (0.25)	−0.15 (0.25)

Note: This table displays the results of DIF analysis for each item of the IES-R questionnaire. The table is structured to present the regression estimates and corresponding p-values for three separate regression models, accounting for covariates: IES-R total score, Extraversion score and age. Each row represents a specific IES-R item. The regression estimates indicate the extent of DIF for each item across the specified grouping variable, while the *p*-values signify the statistical significance of the DIF.

Source: The authors' analysis using ordinal logistic regression modeling.

Table 5
Test-Retest Reliability Indices of the Ukrainian version of the IES-R.

Variable	ICC	r (p), values	Variable	ICC	r (p), values	Variable	ICC	r (p), values
Total Score	0.206	0.412 (<0.01)	Intrusion	0.257	0.424 (<0.001)	Avoidance	0.088	0.181 (>0.05)
Hyperarousal	0.302	0.464 (<0.001)	2	0.313	0.386 (<0.001)	13	0.151	0.168 (>0.05)
21	0.388	0.506 (<0.001)	16	0.248	0.302 (<0.01)	7	0.091	0.124 (>0.05)
15	0.303	0.332 (<0.01)	9	0.105	0.156 (>0.05)	11	0.056	0.092 (>0.05)
4	0.256	0.301 (<0.01)	1	0.141	0.154 (>0.05)	8	0.052	0.068 (>0.05)
19	0.037	0.454 (>0.05)	3	0.067	0.83 (>0.05)	17	0.023	0.034 (>0.05)
10	0.151	0.208 (>0.05)	6	0.047	0.057 (>0.05)	22	−0.039	−0.063 (>0.05)
18	0.177	0.217 (>0.05)	14	0.043	0.05 (>0.05)	5	−0.14	−0.17 (>0.05)
12	0.089	0.137 (>0.05)	20	0.03	0.03 (>0.05)			

Note: This table showcases the Intraclass Correlation Coefficients (ICC) and Pearson's correlation coefficients for both the total score and individual items of the IES-R. Each item from the IES-R is depicted with its respective number, followed by the ICC value and then Pearson's correlation coefficient, r, including the significance level, p. The items are categorized under their corresponding factors: Intrusion, Avoidance, and Hyperarousal. Within each factor, items are arranged in descending order based on their ICC values.
Source: Data derived from the authors' comparative analysis results.

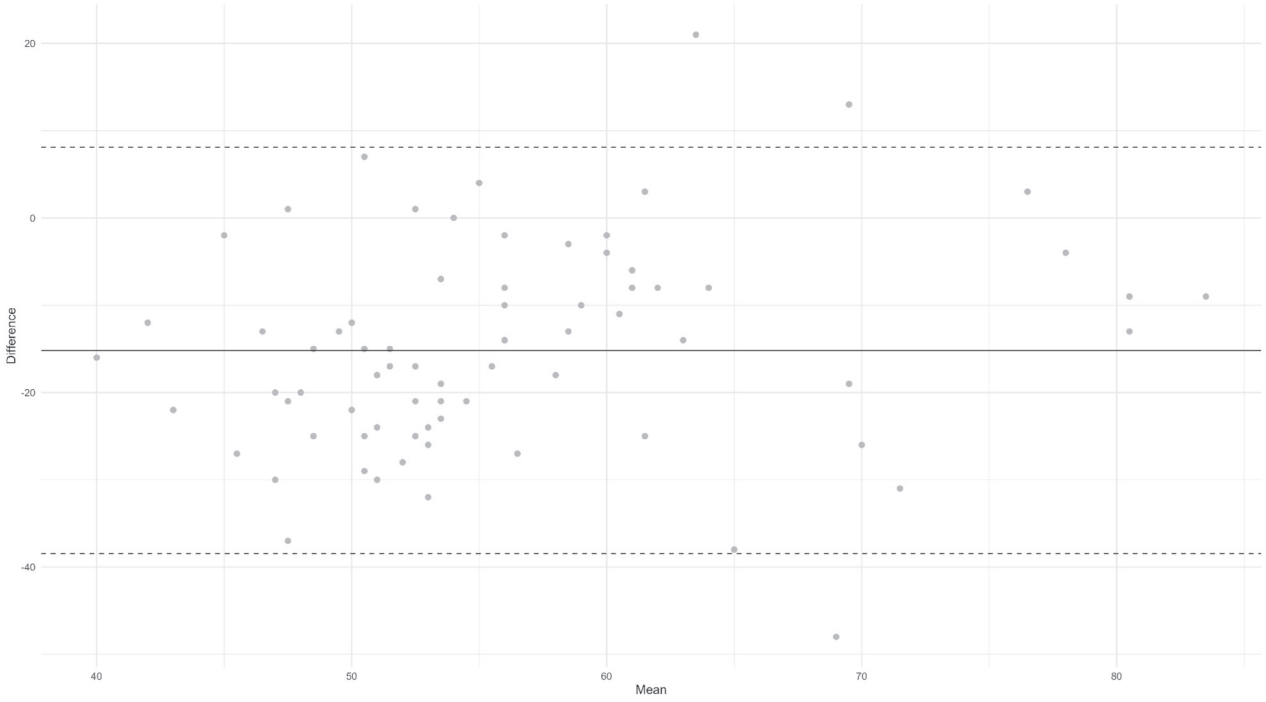

Fig. 3. Bland-Altman Plot of the IES-R Scores from Two Data Collection Waves.
Note: The Bland-Altman plot illustrates the agreement between the IES-R scores obtained at the first and second waves. Each data point on the plot represents an individual participant, with the x-axis depicting the mean score of both waves and the y-axis illustrating the difference between the two scores. The central dashed line signifies the mean difference between the two waves, while the outer dashed lines delineate the Limits of Agreement (LOA), typically set at mean difference ± 1.96 times the standard deviation of the differences.
Source: Visualization of the authors' Bland-Altman analysis.

anticipated range of variability, and these differences appear to be homoscedastic across the spectrum of average scores. However, the presence of outliers suggests that while there's general agreement between the two methods, some discrepancies surpass the range, warranting further research.

The plot's mean difference is slightly below zero, alluding to a subtle trend of symptom reduction over the 8-month interval. This decline in the total score suggests a decreased prevalence of trauma-induced distress symptoms in the studied subset. Given the extended 8-month duration between the data collection waves, variations in participants' psychological or emotional states might reasonably impact the retest outcomes. In light of post-traumatic growth considerations, it's pertinent to augment assessments with supplementary metrics, including life satisfaction and meaningfulness, among others. There's merit in potentially re-evaluating specific items for enhanced clarity or subsequent validation in future iterations.

Analysis of the endorsement frequencies for the IES-R items reveals notable tendencies in the response patterns across different waves of data collection. Specifically, a central tendency is evident in the response frequencies during the first wave, indicating that respondents generally selected middle-range response options. However, by the final wave, a shift toward a side tendency is observed, suggesting that respondents gravitate more toward the extremes of the response scale. These patterns of endorsement frequencies are illustrated in Figs. 4 and 5, providing a visual representation of changes in response distribution over time.

The data suggest that traumatic stress symptoms became more polarized over the observed time interval, leading to more extreme response patterns. A notable shift toward lower frequency responses is primarily associated with items reflecting the Hyperarousal cluster (e.g.,

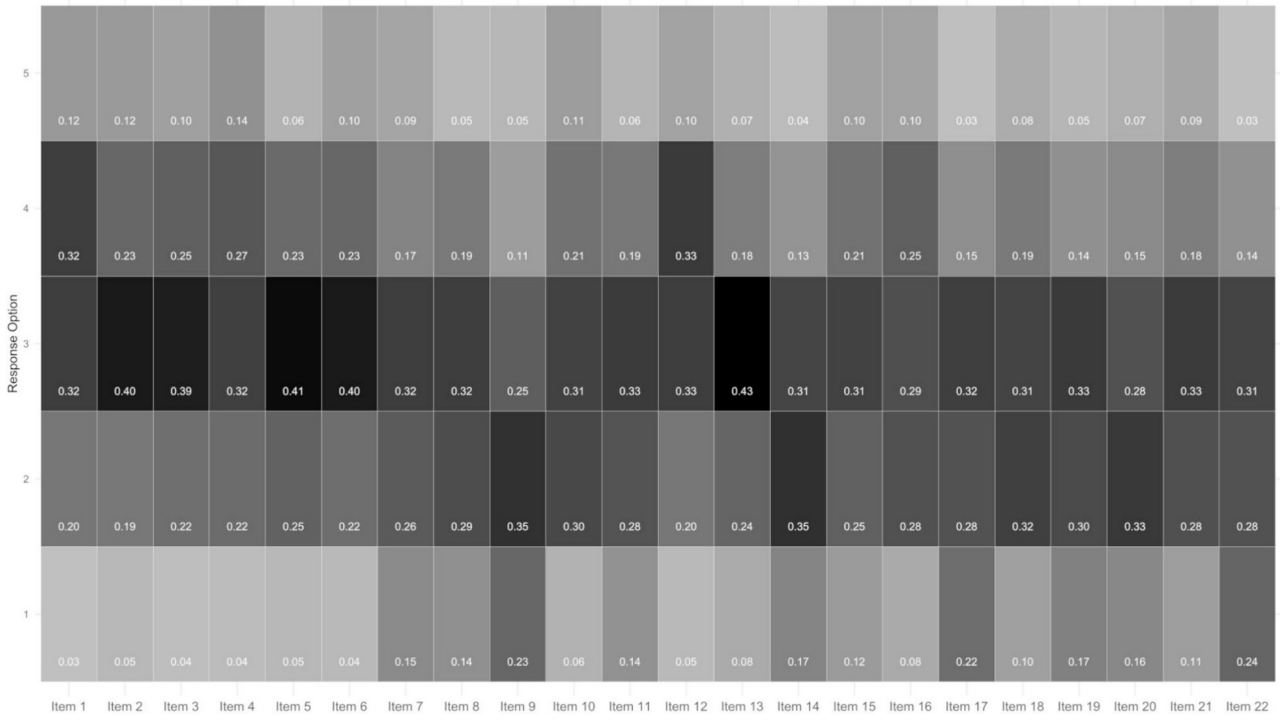

Fig. 4. Endorsement Frequency for IES-R Items in the First Data Collection Wave.
Source: Visualization of data derived from authors' descriptive statistics analysis.

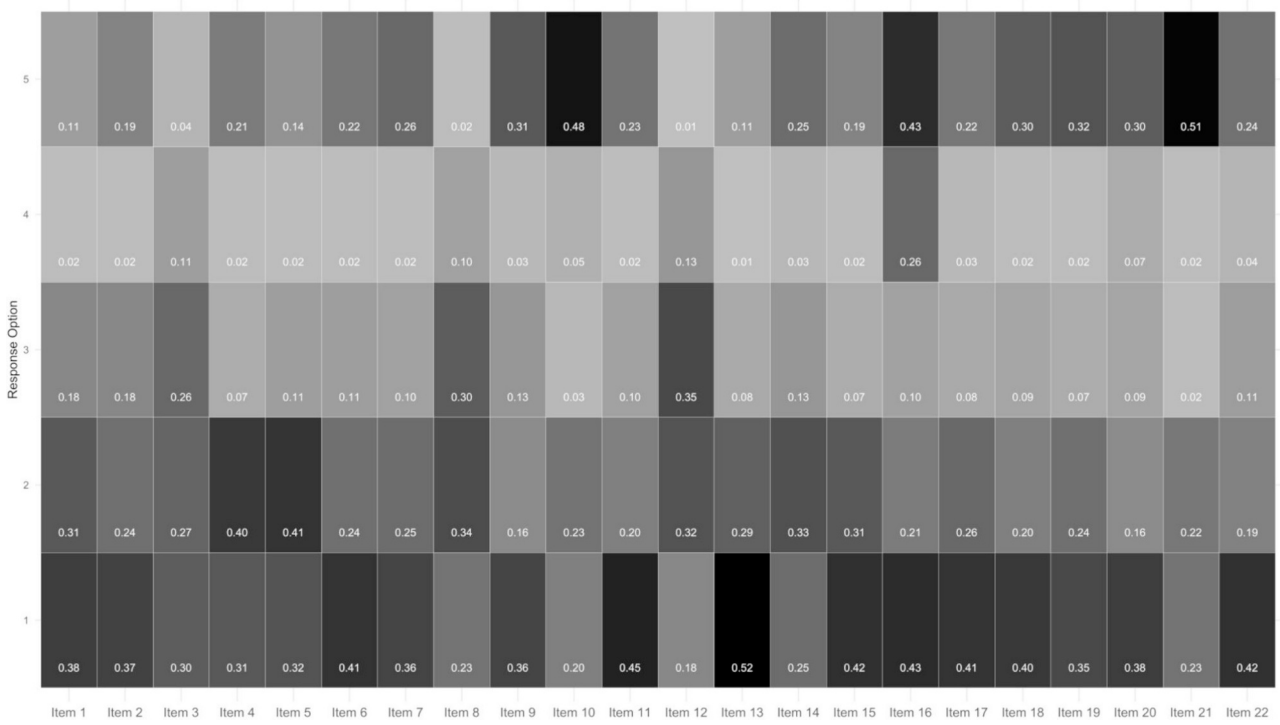

Fig. 5. Endorsement Frequency for IES-R Items in the Second Data Collection Wave.
Source: Visualization of data derived from authors' descriptive statistics analysis.

Items 10, 18, 21). Conversely, higher frequency responses were observed in items within the Avoidance cluster (e.g., Items 11, 13, 17). This shift underscores the reconsolidation of potentially traumatic experiences. Although a general decrease in symptoms was noted earlier by Schlechter et al. [68], present analysis reveals an increase in the Avoidance symptom cluster, likely due to the sustained impact of prolonged stressors [69]. These observed trends may reflect the experiences of the Ukrainian refugee population, rather than broader, commonly observed response patterns.

4. Discussion

The objective of this study was to validate a Ukrainian-language adaptation of the Impact of Events Scale – Revised, tailored for Ukrainian refugees. Our findings confirm that the IES-R effectively measures three distinct yet interrelated symptom clusters in war-affected civilian refugees. The tool demonstrates strong capability in assessing traumatic stress, as indicated by relevant validity indices. The questionnaire was successfully adapted to align with the Ukrainian linguistic and cultural context, largely retaining the original factor structure. Due to model fit indices, item No. 12 was repositioned, resulting in a more balanced distribution of items across the subscales. Given the widespread use of this translation in both Ukrainian literature and clinical practice, a structural revision based on statement reformulation does not appear necessary.

Compared to research conducted in other countries, our study yielded similar results, highlighting the robustness of the IES-R across various contexts. However, assessing the stability and reproducibility of the factorial solution is challenging due to the unique traumatic conditions faced by the population and the significant number of uncontrolled variables, such as group homogeneity, community homogeneity, and the number of individuals per statement. Despite these challenges, the classical model of the IES-R has been validated, underscoring its practicality as a tool for measuring symptom intensity beyond mere classification.

While the IES-R is valuable for measuring subjective distress associated with stress reactions, it offers limited utility in diagnostic contexts. The potential misalignment of identified clusters with the diagnostic criteria for trauma and stressor-related disorders presents a challenge to the tool's clinical applicability. However, the distribution of scores across clusters can still provide insights into symptom severity, aiding in the adjustment of therapeutic interventions. Despite these limitations, the IES-R was included in the National Protocol for Medical Care on Trauma and Stressor-Related Disorders as an instrument for identifying therapy targets in secondary care institutions and as an obligatory diagnostic tool for tertiary care institutions [70].

Küçükertan and Karanci's [71] critique regarding the IES-R's lack of temporal depth is well-founded. The instrument is designed to measure responses during periods of stress, rather than long-term personal changes, as evidenced by test-retest results over an extended period of eight months. Nevertheless, the IES-R remains an effective initial tool for identifying clinically significant symptoms, laying the groundwork for early intervention. In the current context, coordinating broader and simpler psychological support processes for the population may be more critical than conducting in-depth case analyses.

In contrast to the widely used PCL-5 method in Ukrainian practice, the IES-R offers a quantitative rather than qualitative assessment. The observed changes in endorsement frequency highlight trends in symptom intensity that warrant further investigation. The authors believe that the IES-R possesses sufficient sensitivity to monitor symptom dynamics over time and have received permission from the Regional IRB for future research on this topic. The research perspective focuses on the sensitivity of treatment outcomes and the documentation of post-traumatic growth dynamics, with the potential to expand the IES-R's scope. At this point, what initially appeared to be a limitation of self-assessment focused on symptom evaluation has proven to be beneficial [72,73].

The validated Ukrainian version of the IES-R provides clinicians with a culturally sensitive tool to address the needs of Ukrainian refugees seeking healthcare, particularly in the area of secondary prevention. The questionnaire is responsive to the four primary protective factors against post-war trauma and stressor-related disorders, as highlighted by Eshel et al. [74]. It effectively measures the impact of traumatic events on mental health and associated distress. Furthermore, coping-supportive attributes, as quantified by the SWLS model, show negative correlations with IES-R scores. These mediating factors may be crucial, given the link between war exposure and subsequent mental health deterioration among Ukrainians [75].

Given the migration patterns resulting from the threat of commission genocide by Russians, host countries are encouraged to establish a robust mental healthcare infrastructure to support both refugees and their citizens. Prompt recognition of trauma-induced distress is essential for effective intervention during significant migration of Ukrainians. Experience within Ukraine demonstrates that trauma and stressor-related disorders place a significant burden on healthcare professionals and the healthcare system as a whole. From this perspective, we hope that this questionnaire will prove beneficial for both patients and caregivers.

This adaptation can also serve as a foundation for developing assessment tools for Ukrainian-speaking diaspora members or within the Ukrainian healthcare context, providing a reference point specifically tailored to this population. However, the generalizability of our findings is limited by the demographic composition of our sample, which was predominantly composed of individuals identifying as women. This reflects the sex-based distribution among those permitted to leave Ukraine during wartime. This disproportion makes the findings more applicable to female Ukrainians and potentially less representative of the broader population, particularly males. Nonetheless, the questionnaire has demonstrated stability across different socio-demographic groups.

It is important to acknowledge certain limitations. Although the questionnaire maintains a neutral reference by using the phrase “about it,” without directing respondents to a specific potentially traumatic event, adjustments may still be necessary when applying the tool to other populations. Its relevance among military personnel has been demonstrated, with minor wording changes and revisions to bodily manifestations in the statements providing adequate psychometric indices [76]. However, the applicability of the Ukrainian translation for individuals affected by other common traumatic factors, such as occupation, physical and sexual violence, and abandonment, remains an open question.

Given that our sample was one of convenience, it included individuals who were willing to participate in the study, which may not capture the full spectrum of Ukrainian refugees. Additionally, the data were collected from individuals residing in Germany as their host country. Considering the complexity of decision-making in the migration process and the varying degrees of post-migration stress, it is likely that outcomes may differ for individuals living in other host countries.

The study's limitations also include the lack of data on the regions where Ukrainian refugees lived before February 24, 2022. This oversight is significant because residents of different Ukrainian regions may exhibit distinct psychological characteristics, cultural traits, language preferences, and usage patterns, such as Ukrainian, Russian, Crimean Tatar, and others. Moreover, our sample includes only individuals who decided to migrate, while a substantial portion of the target population remains in conditions of recurrent stress, limiting the generalizability of our findings to the entire Ukrainian population.

Thus, while the IES-R's variability highlights the persistence of traumatic stress core symptom clusters, their expression is significantly influenced by socio-cultural dynamics. As a result, it is essential for the international community to adopt diagnostic tools grounded in a Ukrainian-centric perspective. The utilization of the Ukrainian version of the IES-R represents a paradigmatic shift toward a culturally attuned and responsive mental health strategy, one that acknowledges the complex individual and collective experiences in the current challenges.

5. Conclusions

The Ukrainian version of the IES-R serves as an effective tool for measuring the impact of wartime experience on Ukrainian refugees. The questionnaire boasts a robust factor structure and excellent internal consistency. Both convergent and divergent reliability, as well as test-retest reliability, have been confirmed. The DIF analysis obtained

indicates that the questionnaire is resistant to gender-based group invariance. The presented version of the IES-R can be used to adjust diagnostic methodologies pertaining to refugees' mental health. This is crucial for secondary prevention in the context of the global crisis instigated by Russian war crimes.

Data statement

The data are available at the OSF: 8VFSM.

CRediT authorship contribution statement

Liudmyla Krupelnytska: Conceptualization, Data curation, Methodology, Project administration, Writing – review & editing. **Nazar Yatsenko:** Formal analysis, Methodology, Visualization, Writing – original draft. **Vladyslava Keller:** Data curation, Formal analysis, Writing – original draft, Writing – review & editing. **Olha Morozova-Larina:** Conceptualization, Funding acquisition, Methodology, Supervision, Writing – review & editing.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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