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Preliminary evaluation of the seven-item Explicit Stigmatizing Attitudes Toward People With Cancer Scale

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Article

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Abstract

Cancer-related stigma can affect social participation and help-seeking, yet no peer-reviewed Polish-language measure has been identified for overt public stigmatizing attitudes toward people with cancer. We evaluated an archival 10-item pool for the Explicit Stigmatizing Attitudes Toward People With Cancer Scale (ESATC) in 326 adults recruited purposively in Kraków (78.8% women; mean age 26.63 years). Item analysis, internal-consistency estimation, principal-axis factoring, Pearson- and polychoric-correlation parallel analyses, and exploratory construct-relevant comparisons were conducted. Two non-stigmatizing items showed negative corrected item-total correlations despite common-direction scoring, and one insurance-related item showed weak coherence after their removal. The resulting ESATC-7 score had alpha = 0.796 and omega total = 0.799. Both parallel analyses retained one factor, although 12.3% of participants obtained the minimum score and 29.1% scored within two points of it. Scores were lower among 13 participants with personal cancer experience and positively associated with responsibility-related cancer beliefs. ESATC-7 should be regarded as a derivation-sample candidate index of overt exclusionary, restrictive, and concealment-oriented endorsement. Independent validation, formal content-validity assessment, test-retest evaluation, and direct comparison with established cancer-stigma measures are required before broader use.

Introduction

Cancer-related stigma is socially and clinically relevant. In Goffman's classical formulation, stigma is a discrediting attribute that reduces a person in the eyes of others [1]. In contemporary health-stigma models, stigma involves labeling, stereotyping, separation, status loss, and discrimination within a context of social power [2]. These processes can be studied from several perspectives, including public stigma, perceived stigma, experienced discrimination, anticipated stigma, and self-stigma. The present study concerns public attitudes rather than patients' subjective experience of stigma.

Cancer stigma has been studied most extensively in lung cancer, where smoking-related causal attributions can produce blame, guilt, and shame [3, 4]. Patient-reported lung-cancer stigma has also been operationalized with disease-specific instruments such as the Cataldo Lung Cancer Stigma Scale [5]. Stigmatizing responses are relevant beyond lung cancer because cancer may be associated with fear of deterioration, visible treatment effects, assumptions about personal responsibility, and social distancing [6, 7]. Cancer-related stigma has been associated with nihilistic treatment beliefs, delayed medical help-seeking, and lower screening attendance [8–10].

In this study, overt stigmatizing endorsement is defined as self-reported agreement with explicit statements that support social distance, exclusion, concealment of visible illness or treatment effects, or restrictions on occupational, financial, family, reproductive, or public participation for people with cancer. The intended score is unipolar: higher values indicate greater endorsement of overtly stigmatizing propositions. The construct does not include perceived or experienced stigma, anticipated discrimination, internalized stigma, general fear of cancer, cancer fatalism, or positive acceptance.

Because the retained items cover several behavioral domains, the score is described as a candidate index rather than a fully established latent scale. The exploratory factor analysis evaluates whether a common response tendency is empirically plausible in this sample; it does not by itself establish that the complete content domain has been represented [11, 12]. The instrument is named the Explicit Stigmatizing Attitudes Toward People With Cancer Scale (ESATC; Polish: Skala Jawnych Postaw Stygmatyzujących wobec Osób z Chorobą Nowotworową), and the seven-item candidate score is denoted ESATC-7.

The Cancer Stigma Scale (CASS) is a 25-item multidimensional measure developed for non-patient populations. It assesses six domains: awkwardness, severity, avoidance, policy opposition, personal responsibility, and financial discrimination [13]. The ESATC was not designed as an adaptation or short form of the CASS. Its intended scope is narrower: rapid assessment of explicit endorsement of overt exclusionary or restrictive statements. Several ESATC items nevertheless overlap conceptually with CASS domains, particularly avoidance, policy opposition, and financial discrimination. The potential contribution of the ESATC therefore lies in brevity and a deliberately overt item format, not in replacing the broader CASS framework. Cross-cultural validation of the Japanese CASS included translation, test-retest reliability, internal consistency, and concurrent validity in a general-population sample, illustrating the broader validation process required for a culturally adapted stigma measure [14]. Direct comparison with the CASS is required before convergent validity or incremental utility can be claimed.

In the Polish context, psychosocial oncology measurement has more often focused on patients' needs, adjustment, or quality of life than on public stigmatizing attitudes. Polish validation work has been reported for other psycho-oncological constructs [15], but the targeted search described in the Method did not identify a peer-reviewed Polish-language instrument specifically designed to assess overt public stigmatizing endorsement toward people with cancer.

The original 10-item pool included eight overtly stigmatizing statements and two non-stigmatizing statements. The latter were included to test whether acceptance-oriented wording functioned as the reverse pole of overt stigmatizing endorsement. This design question was exploratory because acceptance of a non-stigmatizing statement and rejection of an overtly stigmatizing statement need not form a simple bipolar continuum.

The study therefore evaluated item performance and internal consistency in the original 10-item pool, tested whether the two non-stigmatizing items functioned coherently after common-direction scoring, derived a defensible brief score, examined its exploratory internal structure using Pearson and polychoric methods, quantified lower-end concentration, and explored associations with selected cancer-related beliefs, a KAS-derived social-desirability control, and personal cancer experience.

Results

All analyses of the ESATC item pool are based on the complete derivation sample (N = 326). The KAS-derived auxiliary analysis is based on N = 314 valid item-level cases.

Descriptive statistics and lower-end concentration

Score distributions are summarized in Table 2. For the ESATC-7 total score, 12.3% of participants obtained the minimum possible score and 29.1% scored within two points of the minimum. This lower-end concentration is substantial for a brief attitudinal measure. It restricts differentiation among respondents with low overt stigma and may attenuate correlations, reduce sensitivity to improvement, and complicate interpretation of group comparisons.

Table 2
Score distributions and lower-end concentration.

Score	N	M	SD	Mdn	IQR	Observed range	Minimum, n (%)	Within 2 points of minimum, n (%)
10-item pool	326	20.25	5.58	20.00	8.00	10–38	5 (1.5%)	15 (4.6%)
8-item pool	326	14.88	5.34	14.00	8.00	8–32	34 (10.4%)	92 (28.2%)
ESATC-7	326	13.47	5.13	13.00	7.00	7–31	40 (12.3%)	95 (29.1%)
Note. Theoretical ranges were 10–50, 8–40, and 7–35 for the 10-, 8-, and 7-item scores, respectively.								
Item reduction from the original 10-item pool								

The original 10-item pool had limited internal consistency (alpha = 0.640). Despite common-direction scoring, US3 and US8 had negative corrected item-total correlations. Removing either item increased alpha, but the negative associations alone do not establish a reverse-wording method effect. They show only that the two acceptance-oriented items did not function as interchangeable reverse indicators of the overtly stigmatizing item pool in this sample. In the 10-item pool, alpha after deleting US1 was .638, essentially unchanged from the initial value. The later removal of US1 was based on its weak performance after US3 and US8 had been removed. Item-level results are shown in Table 3.

Table 3
Item performance in the original 10-item pool.

Item	M	SD	Corrected item-total r	Alpha if deleted	Decision
US1	1.41	0.81	0.170	0.638	Removed after 8-item evaluation
US2	1.58	0.93	0.395	0.601	Retained
US3	1.65	1.32	-0.059	0.699	Removed: non-stigmatizing item did not cohere
US4	1.88	1.17	0.611	0.544	Retained
US5	1.90	1.07	0.615	0.550	Retained
US6	2.44	1.29	0.517	0.562	Retained
US7	2.00	1.12	0.548	0.562	Retained
US8	3.71	1.56	-0.105	0.728	Removed: non-stigmatizing item did not cohere
US9	1.99	1.08	0.392	0.598	Retained
US10	1.68	0.95	0.341	0.610	Retained
Note. All item values are in the common analytical direction: higher values indicate stronger stigmatizing endorsement. Negative corrected item-total correlations for US3 and US8 are compatible with several explanations and are not treated as proof of a specific method effect.					
Final seven-item candidate: reliability and item performance					

After excluding US3, US8, and US1, the ESATC-7 total score showed acceptable internal consistency for preliminary group-level research (alpha = 0.796, 95% CI [0.755, 0.829]; omega total = 0.799, 95% CI [0.759, 0.832]). Corrected item-total correlations ranged from 0.376 to 0.649. Principal-axis loadings ranged from 0.407 to 0.757, and ordinal loadings ranged from 0.500 to 0.829. US10 was the weakest retained item but remained stronger than US1 on both item-total association and factor loading (Table 4).

Table 4
Item performance of the ESATC-7 total score.

Item	M	SD	Corrected item-total r	Alpha if deleted	PAF loading (h^2)	Ordinal loading (h^2)
US2	1.58	0.93	0.442	0.784	0.494 (0.244)	0.627 (0.394)
US4	1.88	1.17	0.649	0.745	0.757 (0.572)	0.829 (0.687)
US5	1.90	1.07	0.621	0.752	0.712 (0.507)	0.772 (0.597)
US6	2.44	1.29	0.514	0.775	0.588 (0.346)	0.640 (0.410)
US7	2.00	1.12	0.597	0.756	0.683 (0.466)	0.714 (0.510)
US9	1.99	1.08	0.490	0.776	0.543 (0.295)	0.612 (0.374)
US10	1.68	0.95	0.376	0.794	0.407 (0.166)	0.500 (0.250)
Note. PAF, principal-axis factoring. Pearson-based estimates use the product-moment correlation matrix; ordinal estimates use the polychoric correlation matrix.						
Exploratory internal structure						

The ESATC-7 total score was suitable for exploratory factor analysis (KMO = 0.826; Bartlett's $\chi^2(21) = 604.30$, P = 1.99 × 10 − 114). Pearson-based parallel analysis retained one factor: only the first observed eigenvalue exceeded both the mean and the 95th percentile of random eigenvalues. The second observed eigenvalue was 1.031 but remained below both thresholds. The first observed eigenvalue represented 45.44% of total variance in the Pearson correlation matrix. The one-factor PAF loading solution had a sum of squared loadings of 2.596, corresponding to 37.08% of total item variance. Detailed observed and simulated eigenvalues are reported in Supplementary Table S1; the scree plot is shown in Fig. 1.

The polychoric results also retained one factor. The first observed polychoric eigenvalue was 3.727, exceeding the permutation-based parallel-analysis mean (1.273) and 95th-percentile threshold (1.376). The second observed eigenvalue was 0.996, below both the corresponding mean (1.157) and 95th-percentile threshold (1.227); all subsequent observed eigenvalues were also below their thresholds. Ordinal alpha was 0.851 and ordinal omega total was 0.854. The first polychoric eigenvalue represented 53.24% of total variance in the polychoric correlation matrix, whereas the sum of squared one-factor ordinal loadings was 3.222, corresponding to 46.02% of total item variance. Detailed thresholds are reported in Supplementary Table S2, and the Pearson and polychoric summary estimates are compared in Table 5.

Table 5
Pearson-based and polychoric-correlation results.

Analysis	Alpha (95% CI)	Omega total (95% CI)	First eigenvalue	Eigenvalue as % of total variance	Loading-based % of total item variance
Pearson-based	0.796 [0.755, 0.829]	0.799 [0.759, 0.832]	3.181	45.44	37.08
Polychoric	0.851	0.854	3.727	53.24	46.02
Note. Eigenvalue percentages summarize total variance associated with the first eigenvalue; loading-based percentages use the sum of squared one-factor loadings divided by seven. Bootstrap confidence intervals are reported for Pearson-based alpha and omega total; ordinal coefficients are point estimates.					
Eight-item candidate and removal of US1					

After removal of US3 and US8, the 8-item candidate retained US1 and had alpha = 0.781, omega total = 0.782, KMO = 0.824, first eigenvalue = 3.226, and an observed-eigenvalue percentage of 40.33%. In that candidate, US1 showed a corrected item-total correlation of 0.182, a PAF loading of 0.196, and communality of 0.038. The 7-item score had alpha = 0.796, omega total = 0.799, and KMO = 0.826. The 7- and 8-item scores were almost perfectly correlated (Pearson r = 0.989; Spearman rho = 0.988), indicating that removal of US1 changed participant rank ordering very little.

Exploratory construct-relevant associations

Participants reporting personal cancer experience (n = 13) had lower ESATC-7 scores (M = 8.23, SD = 0.83, median = 8, range 7–9) than participants without such experience (n = 313; M = 13.69, SD = 5.12, median = 13, range 7–31). The two-sided asymptotic Mann-Whitney test was significant, U = 600.5, P = 1.54 × 10 − 5. Cliff's delta was − 0.705 (95% stratified percentile-bootstrap CI [− 0.791, − 0.612]). Given the small, floor-compressed subgroup, this comparison is hypothesis-generating (Table 6).

Table 6
ESATC-7 scores by personal cancer experience.

Group	n	M	SD	Mdn	IQR	Range
Personal cancer experience	13	8.23	0.83	8	1	7–9
No personal cancer experience	313	13.69	5.12	13	8	7–31
Note. The personal-experience subgroup was small and strongly concentrated at the lower end of the score.						

The ESATC-7 total score was most strongly associated with the belief that lung cancer affects only people who smoke or previously smoked (Spearman's ρ = 0.307, P = 1.49 × 10 − 8, FDR-adjusted q = 8.97 × 10 − 8). Smaller associations were observed for the belief that most people with cancer contributed to

their disease (ρ = 0.163, P = 0.003, q = 0.010) and the belief that not smoking completely prevents lung cancer (ρ = 0.138, P = 0.013, q = 0.025). The reconstructed KAS-derived auxiliary score was not significantly associated with the ESATC-7 total score (ρ = 0.103, P = 0.068, q = 0.082). Full results are shown in Table 7.

Table 7
Exploratory correlations with the ESATC-7 total score.

Variable	N	Spearman's ρ	P	FDR-adjusted q
Belief that people with cancer should not pay rent or utilities	326	0.105	0.058	0.082
Belief that cancer cannot be prevented	326	0.036	0.512	0.512
Belief that most people with cancer contributed to their disease	326	0.163	0.003	0.010
Belief that lung cancer affects only people who smoke or smoked	326	0.307	$1.49 \times 10 - 8$	$8.97 \times 10 - 8$
Belief that not smoking completely prevents lung cancer	326	0.138	0.013	0.025
KAS-derived social-desirability score	314	0.103	0.068	0.082

Note. Belief variables were single-item indicators. q values use the Benjamini-Hochberg procedure across six exploratory correlations. The KAS-derived variable is the reconstructed 27-item auxiliary score described in the Methods and is not the standard 29-item KAS total.

Discussion

This study makes three specific contributions. First, it identifies a seven-item Polish candidate index for overt stigmatizing endorsement toward people with cancer. Second, it preserves a transparent record of the original item pool, scoring direction, item-reduction sequence, and conceptual mapping to CASS domains. Third, it evaluates dimensionality with both Pearson-based and polychoric parallel analyses while reporting eigenvalue-based total-variance percentages separately from loading-based variance. Across these analyses, the ESATC-7 total score showed internal consistency near .80 and a dominant first dimension convergent across estimation methods in the derivation sample.

The ESATC-7 total score operationalizes agreement with explicit statements supporting social distance, employment or financial exclusion, restrictions on parenthood or public participation, and concealment of visible treatment effects. It is therefore a unipolar index of overt endorsement rather than a measure of patients' perceived or experienced stigma. The retained items span several social domains, but both Pearson-based and polychoric analyses indicate that they shared a dominant response tendency in this sample. US3 and US8 did not cohere despite correct common-direction scoring. Their negative item-total

correlations cannot be attributed to a scoring error; wording direction, friendship or proximity content, and beliefs specific to lung cancer remain plausible explanations.

Both parallel analyses retained one factor, and the ordinal estimates were stronger than the Pearson-based estimates, as expected for skewed ordered responses. The CASS remains the broader, multidimensional reference measure of public cancer stigma, whereas ESATC-7 is shorter and deliberately focused on overt exclusionary or restrictive endorsement. The present results do not propose a replacement for the CASS or a new comprehensive theory of cancer stigma. They support testing whether a brief overt index adds practical value when respondent burden is a central constraint.

Associations with responsibility-related beliefs were directionally consistent with the proposed interpretation, particularly the belief that lung cancer affects only smokers. Participants reporting personal cancer experience also had lower scores. The KAS-derived score was not significantly associated with the ESATC-7 total score. These analyses provide preliminary external context rather than a substitute for direct convergent and discriminant validation.

The study is based on archival data. File metadata indicates that the dataset was compiled in January 2017, but exact administration dates were not preserved; the measured attitudes may therefore differ from current public attitudes. The sample was purposive, local, young, predominantly female, and non-representative. Student status was not collected, so the possible contribution of working students cannot be quantified. Company sector, occupational position, the number approached, and the response fraction were unavailable. The personal-cancer-experience subgroup included only 13 participants.

The same sample was used for item selection and evaluation, making reliability and structural estimates potentially optimistic. Formal content validity was not established before data collection, and the retrospective content map cannot replace expert ratings or cognitive interviews. The final score showed substantial lower-end concentration, limiting differentiation and likely sensitivity to improvement. No established public cancer-stigma measure was administered, the belief indicators were single items, and the KAS control was a reconstructed 27-item auxiliary score necessitated by an archival recoding anomaly rather than the standard complete instrument. The no opinion response may not function as a psychometric midpoint. Test-retest reliability, measurement error, responsiveness, measurement invariance, and item-level functioning remain untested. The Polish literature search was targeted rather than systematic. These constraints preclude norms, cut-off scores, individual classification, population generalization, and claims about the full cancer-stigma construct.

Further development should begin with an explicit content model, expert evaluation of relevance and clarity, and cognitive interviews with the intended population. A broadened item pool should include subtler forms of awkwardness, blame, fear, and avoidance while reducing lower-end concentration. The revised instrument should then be evaluated in an independent and more diverse sample using ordinal confirmatory analysis, direct comparison with the CASS, test-retest reliability, discriminant validity, measurement invariance, and item-response methods. Until those steps are completed, the ESATC-7

total score is most appropriately used as an exploratory group-level research index rather than for clinical, diagnostic, normative, or intervention-effectiveness decisions.

The analyses support the ESATC-7 total score as a transparent, empirically defined candidate index of overt stigmatizing endorsement toward people with cancer. Its immediate scientific value lies in providing a brief Polish-language measure for further study, documenting the original item-development record, and demonstrating convergent Pearson-based and ordinal evidence for a dominant first dimension. Independent validation will determine whether the index offers sufficient content coverage and lower-range sensitivity for broader research use.

Methods

Participants

The derivation sample comprised 326 participants with complete responses to all 10 original ESATC items. Participants were adults entering a multi-company office building for work and were recruited purposively in Kraków, Poland. Women constituted 78.8% of the sample (n = 257), and men 21.2% (n = 69). Age ranged from 18 to 67 years (M = 26.63, SD = 8.24, Mdn = 23), indicating a predominance of younger adults. Most participants reported secondary education, and 81.6% were single. Student status was not recorded; given the age, education, and marital-status profile, some participants may have been working students, but this cannot be established from the archival dataset. Because recruitment was purposive and non-representative, population-level or normative interpretations are not warranted. Participant characteristics are presented in Table 1.

Table 1
Participant characteristics.

Variable	Value
Sex: women	257 (78.8%)
Sex: men	69 (21.2%)
Age	M = 26.63, SD = 8.24, Mdn = 23, range 18–67
Education: secondary	247 (75.8%)
Education: higher	68 (20.9%)
Education: postgraduate	11 (3.4%)
Residence: city	224 (68.7%)
Residence: village	102 (31.3%)
Marital status: single	266 (81.6%)
Marital status: married	51 (15.6%)
Marital status: divorced	9 (2.8%)
Personal cancer experience: yes	13 (4.0%)
Cancer in family/acquaintances: yes	215 (66.0%)
Previous contact with a person with cancer: yes	237 (72.7%)
Cancer screening: never	271 (83.1%)
Cancer screening: once	32 (9.8%)
Cancer screening: several times	23 (7.1%)
Note. Percentages are based on the complete ESATC derivation sample. Screening participation is descriptive only because the type of screening was not recorded.	
Procedure and ethics	

Data were collected using an anonymous paper-and-pencil questionnaire. Archival workbook metadata indicates that the dataset was compiled in January 2017; exact dates of questionnaire administration were not retained. Recruitment was purposive and onsite: individuals entering the building for work were invited to participate. The building housed several companies; however, company names, employment sectors, occupational positions, the number approached, and the response fraction were not recorded. Participation was voluntary, and informed consent was obtained from all participants before questionnaire completion. No identifying personal data, employer data, occupational-position data, or medical-record data were collected. All methods were carried out in accordance with relevant guidelines and regulations and with the Declaration of Helsinki. The study was retrospectively reviewed by the

Committee for the Ethics of Research Involving Human Participants at Andrzej Frycz Modrzewski Krakow University. In Resolution No. DEC-KEBN/01/08/2026 of 13 August 2026, the Committee determined that, in view of the purpose, methodology, scope, and timing of the study, the research did not require an opinion of the Committee prior to its commencement. The original survey material had been collected before January 2017, before the Committee was established. In 2025–2026, only secondary statistical analyses of the retained, irreversibly anonymized dataset and preparation of the manuscript were undertaken; no participants were recruited, no new data were collected, and study participants were not contacted again.

Item pool, content appraisal and scoring

The archival item pool for the Explicit Stigmatizing Attitudes Toward People With Cancer Scale (ESATC) contained 10 Polish-language items rated on a five-category response format. The pool covered workplace contact, friendship, family roles, employment, credit access, parenthood, physical proximity, public presence, and concealment of visible treatment effects. General scale-construction recommendations informed the analytical approach [16–18]. The available study documentation did not preserve a pre-administration expert-panel assessment, content-validity indices, cognitive interviews, or a formal record of item-generation decisions. Consequently, formal content validity cannot be claimed. To make the intended content domain transparent, Supplementary Table S3 provides a retrospective item-content map and identifies the closest CASS domains. This author-led mapping is descriptive and does not replace expert or target-population content-validity studies, which require evaluation of relevance, comprehensiveness, and comprehensibility [12, 19].

The paper questionnaire presented five verbal response categories: definitely yes, rather yes, no opinion, rather no, and definitely no; numerical values were not printed beside the categories. In the preserved analytic dataset used for the reported analyses, responses were coded from 1 = strongly disagree to 5 = strongly agree. The non-stigmatizing items US3 and US8 were reverse-scored as 6 minus the entered response, whereas the overtly stigmatizing items retained their entered values. Higher analyzed values therefore indicated stronger stigmatizing endorsement for all 10 items. The middle category no opinion was treated as the numerical midpoint; because it may also represent uncertainty or lack of knowledge, this choice is a limitation of the original response format.

After item analysis, US3 and US8 were removed because they showed negative corrected item-total correlations despite common-direction scoring. The pattern demonstrates non-coherence with the remaining pool but does not identify its cause. Plausible explanations include wording-direction effects, content heterogeneity, or different interpretations of acceptance-oriented statements. US1 was subsequently removed because, within the 8-item candidate, it showed a corrected item-total correlation of .182, a principal-axis loading of .196, and communality of .038, all indicating weak coherence with the remaining item set relative to conventional exploratory criteria [20]. The ESATC-7 total score is the sum of US2, US4, US5, US6, US7, US9, and US10. Possible scores range from 7 to 35.

Additional variables

Exploratory construct-relevant analyses used personal cancer experience (yes/no), five single-item cancer-related beliefs, and a social-desirability control derived from the Social Approval Questionnaire (Kwestionariusz Aprobaty Społecznej; KAS) [21]. The archived dataset contained 29 dichotomous KAS responses, with KAS1-KAS5 stored under legacy variable names. Audit of the archived recoding block identified a column-shift anomaly affecting KAS10-KAS12: the source response for KAS10 was not retained in the derived block, whereas the source response for KAS12 appeared in both direct and reverse-keyed form. The archived aggregate was therefore not used as a standard KAS total. Instead, an auxiliary 27-item score was reconstructed directly from the preserved item-level responses, excluding KAS10 and KAS12. Diagnostic responses were scored 1 and non-diagnostic responses 0. The positively keyed items were 1, 2, 4, 6, 8, 11, 14, 15, 16, 17, 19, 20, 21, 24, 26, and 29; reverse-keyed items were 3, 5, 7, 9, 13, 18, 22, 23, 25, 27, and 28. Twelve participants had missing or invalid values among the retained items, leaving N = 314. The reconstructed score had alpha = 0.754 (95% percentile-bootstrap CI [0.703, 0.793]). It is treated only as an auxiliary KAS-derived control and not as the standard 29-item KAS total or as a psychometric evaluation of KAS.

Targeted search for Polish-language measures

To make the contextual claim about instrument availability reproducible, a targeted search was conducted on July 12, 2026, in PubMed, Biblioteka Nauki, and the Polish Platform of Medical Research (PPM), supplemented by Google web searching for grey literature. English searches combined ("cancer stigma" OR "cancer stigmatization") AND (Polish OR Poland) AND (scale OR questionnaire OR instrument OR validation), and the exact phrase "Cancer Stigma Scale" with Polish OR Poland. Polish searches combined (rak OR nowotwór OR onkologiczny) AND (stygmatyzacja OR piętno OR stygma) AND (skala OR kwestionariusz OR narzędzie OR walidacja OR adaptacja). Titles, abstracts, and, when necessary, full texts were screened for peer-reviewed Polish-language instruments intended to assess public stigmatizing attitudes toward people with cancer in non-patient respondents. No eligible instrument was identified. This was a targeted contextual search, not a systematic review.

Statistical analysis

Analyses were conducted on complete cases for the original 10 ESATC items (N = 326). Data preparation and descriptive analyses used IBM SPSS Statistics 29 and Python 3.13.5 with pandas 2.2.3, NumPy 2.3.5, SciPy 1.17.0, matplotlib 3.10.8, and openpyxl 3.1.5. Polychoric correlations, bootstrap confidence intervals, factor extraction, and parallel-analysis routines were implemented in Python. Descriptive statistics included the mean, standard deviation, median, interquartile range, observed range, skewness, kurtosis, the proportion at the minimum possible score, and the proportion within two points of the minimum. Internal consistency was assessed using Cronbach's alpha and McDonald's omega total. Omega total was calculated from the unrotated one-factor principal-axis solution as $\omega t = (\Sigma \lambda i)^2 / [(\Sigma \lambda i)^2 + \Sigma \psi i]$, where λi denotes the standardized factor loading and $\psi i = 1 - \lambda i^2$ for a correlation-matrix solution. The same definition was applied to the Pearson and polychoric one-factor solutions. For alpha and

Pearson-based omega, 95% confidence intervals were obtained from 5,000 nonparametric case-resampling bootstrap samples of N = 326, with alpha and omega recalculated in every resample. The reconstructed KAS-derived alpha used the same procedure with N = 314. Percentile limits were the 2.5th and 97.5th percentiles. Each stochastic procedure initialized a separate NumPy random generator with seed 20260711; no bootstrap replication failed to produce an admissible estimate. Values around 0.70 or higher were treated as a pragmatic minimum for preliminary group-level research rather than a universal decision threshold [22].

Factorability was evaluated using the Kaiser-Meyer-Olkin index [23] and Bartlett's test of sphericity [24]. Internal structure was examined using exploratory factor analysis with unrotated principal-axis factoring and squared multiple correlations as initial communality estimates. Pearson-based factor retention used Horn's parallel analysis with 1,000 independently generated 326 x 7 matrices of standard-normal values. For each replication, a Pearson correlation matrix was calculated and its ordered eigenvalues were retained; the mean and empirical 95th percentile of each eigenvalue distribution formed the comparison thresholds (seed 20260711). The eigenvalue-greater-than-one rule was not used as a retention criterion [25].

Because the items were ordinal and skewed, a polychoric correlation matrix was estimated with a two-step pairwise maximum-likelihood procedure: category thresholds were estimated from observed marginal proportions and each latent bivariate correlation was optimized conditional on those thresholds [26]. The observed-data matrix used bounded scalar optimization over ρ from − 0.98 to 0.98. Polychoric parallel analysis used 1,000 datasets created by independently permuting each item, thereby preserving every observed marginal distribution. For computationally efficient and exactly reproducible estimation in the permutation replications, pairwise log-likelihoods were evaluated on a fixed ρ grid from − 0.98 to 0.98 in increments of 0.002, followed by local parabolic interpolation around the maximum. The polychoric matrix was re-estimated for every permutation (seed 20260711). Ordinal alpha, ordinal omega total, ordinal loadings, and communalities were then calculated from the observed polychoric matrix. This procedure follows recommendations to base retention decisions for ordinal items on polychoric rather than solely Pearson correlations [27].

Percentages derived from observed eigenvalues are reported explicitly as the proportion of total variance represented by the eigenvalue. They are not labeled as principal-axis-factor variance explained. For the one-factor loading solutions, the sum of squared loadings divided by the number of items is reported separately. Confirmatory factor analysis was not performed because using the same sample for item selection and confirmation would overfit the internal structure and would not constitute independent validation [28, 29]. The ESATC-7 total score is therefore treated as a derivation-sample solution; the implications are discussed below.

Personal-experience comparisons were interpreted as hypothesis-generating because the exposed subgroup was very small. The personal-experience comparison used a two-sided asymptotic Mann-Whitney test with tie correction and no continuity correction. Cliff’s delta was defined as P(X_personal >

X_no-personal) − P(X_personal < X_no-personal), so negative values indicate lower ESATC-7 scores in the personal-cancer-experience group. Its 95% confidence interval was obtained from 5,000 stratified nonparametric bootstrap samples, with cases resampled with replacement separately within the two groups while preserving n = 13 and n = 313; percentile limits and seed 20260711 were used. Associations with the five cancer-related belief items and the KAS-derived score were assessed using Spearman correlations. Benjamini-Hochberg false-discovery-rate adjusted q values are reported across these six exploratory correlations. Nonparametric statistics were used because the ESATC-7 total score was right-skewed and showed lower-end concentration. All inferential tests were two-sided with α = 0.05.

Declarations

Competing interests

The authors declare no competing interests.

Author Contribution

K.G. conceptualized the study, developed the methodology, conducted the investigation, curated the data, performed the formal analyses, prepared the visualizations, and wrote and revised the manuscript. K.G. approved the final version of the manuscript and accepts responsibility for the integrity of the work.

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Data Availability

The dataset analysed during the current study is available from the corresponding author on reasonable request.

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Figures

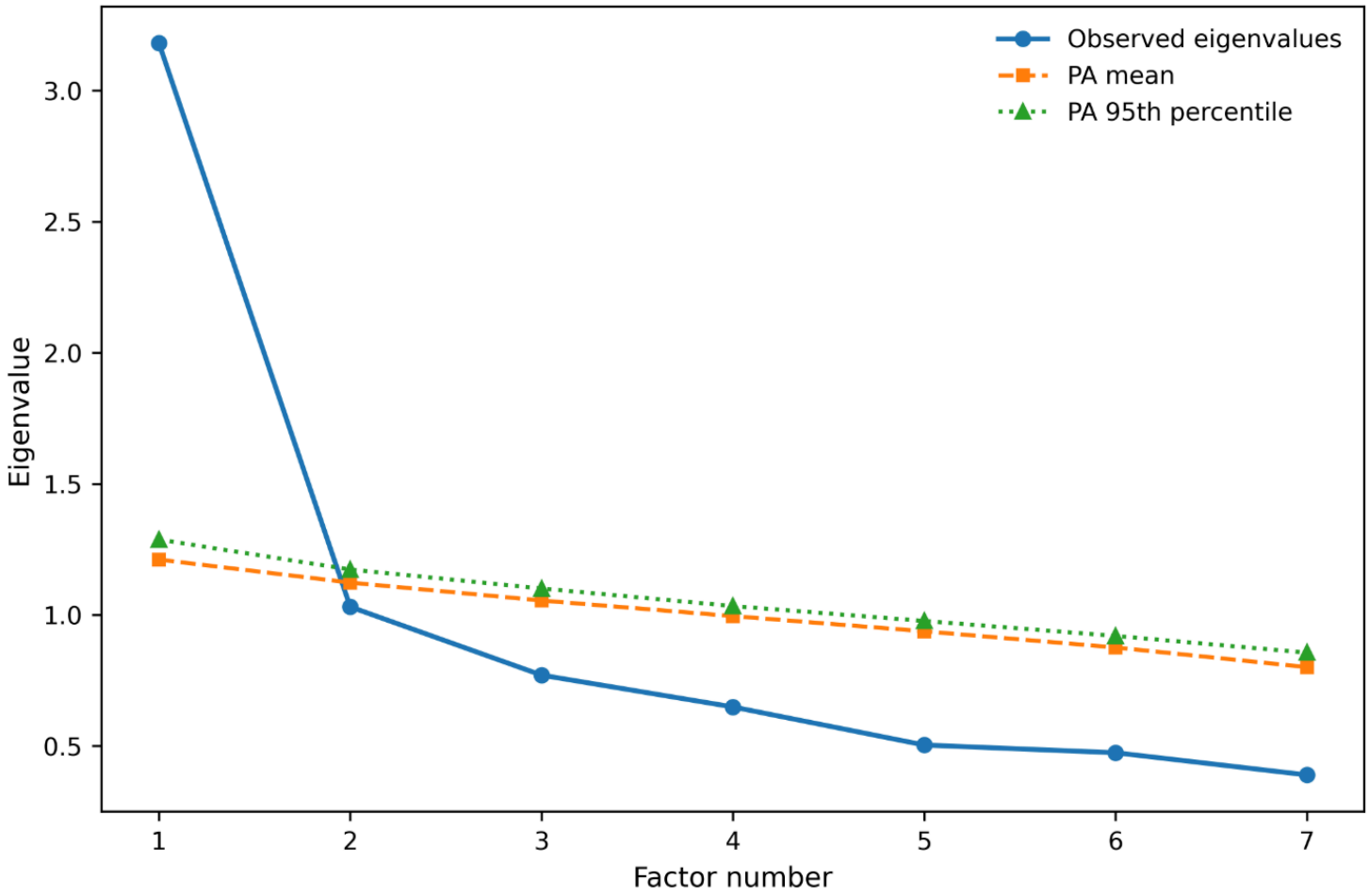


Figure 1

Pearson-based scree plot and parallel analysis for the ESATC-7 total score. The first observed eigenvalue exceeded both the mean and 95th-percentile random-data thresholds; the second observed eigenvalue did not. Parallel-analysis thresholds were generated from 1,000 independent 326 × 7 standard-normal datasets (seed 20260711).

Supplementary Files

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- SupplementaryInformation.docx