



Development and Validation of the Mental Health Scale for Maltreated Children

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Objective This study aimed to develop and validate a comprehensive self-report questionnaire to assess emotional and behavioral problems and psychological trauma in maltreated children.

Methods The Mental Health Scale for Maltreated Children (MHS-MC) was constructed to encompass five major symptoms (depression, anxiety, inattention/hyperactivity/impulsivity, aggression/defiance, and psychological trauma) prevalent in maltreated children. Critical items and ego-resilience subscale were also devised to increase clinical utility. After informed consent, 205 children (maltreated children, n=157, 76.6%) were recruited nationwide, and they answered a package of self-report measures, including the MHS-MC. Reliability, construct validity, concurrent validity, and criterion-related validity were examined to explore the psychometric properties.

Results The reliability was good to excellent. Confirmatory factor analysis yielded a five-factorial solution for the symptom subscales supporting construct validity. In logistic regression, the total scores of the MHS-MC predicted membership in the maltreated group. Criterion-related validity was generally satisfactory in that all subscales of the MHS-MC showed significant correlations with relevant measures in the expected direction.

Conclusion This is the first attempt to develop a comprehensive psychological scale based on nationwide data collected from maltreated Korean children. We hope that the continued standardization of this scale will contribute to evidence-based clinical and policy decision-making for maltreated children.

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INTRODUCTION

Child maltreatment is a representative traumatic childhood experience, including physical, emotional, and sexual abuse, and neglect.^{1,2} Unfortunately, it is a common public health issue.³ It is globally estimated that up to 1 billion children aged 2–17 years have experienced any form of physical, sexual, or emotional violence or neglect in the past.⁴ In South Korea, the number of suspected case reports has continuously risen,

mounting up to 52,083 cases, of which 72.2% (37,605 cases) were finally judged as child maltreatment crime cases in the year 2021.⁵

Notably, child maltreatment negatively impacts the affected children's physical and psychological well-being.³ While physical consequences of abuse (e.g., injury, death) can be visible and apparent, psychological consequences may be invisible or overlooked if not carefully assessed. However, there is ample evidence that exposure to childhood maltreatment is a robust risk factor for various short- and long-term mental health problems, raising the need for early detection of psychological after-effects. For example, in a systematic review and meta-analysis, child maltreatment was associated with a higher likelihood of being diagnosed with depressive disorder, anxiety disorder, or post-traumatic stress disorder (PTSD).¹ Similarly, the experience of child maltreatment demonstrated a medium-sized effect for both internalizing (e.g., depression, anxiety) and externalizing (e.g., aggression, impulsivity) problems of children in a meta-analysis of research focusing on the

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relation between child maltreatment and psychosocial maladaptation from 1990 to 2016 in South Korea.⁶ Child maltreatment was not only associated with the development of major psychiatric symptoms and disorders in childhood and adulthood, but it was also related to earlier onset, more severe course, and poor psychotherapy prognosis, which dampened this population's treatment response.⁷

Therefore, many countries, including South Korea, are scaling up national actions to prevent and respond to child maltreatment.³ There is a consensus that child maltreatment is not a private but a societal issue, leading governments to invest more resources in strengthening legislative and supportive frameworks for abused and neglected children.^{3,5,8-10} However, more attention is being paid to retributive justice by enforcing forensic investigations, child abuse offender punishment, or education. In contrast, implementing support systems for the psychological recovery of abused and neglected children is insufficient. Additionally, few countries are equipped with well-defined, measurable indices to identify problems and monitor and evaluate the effects of such efforts,³ which limits evidence-based approaches to enhance the effectiveness of prevention and service planning.

In fact, there are considerable individual differences in the psychological after-effects of maltreated children. As noted earlier, although child abuse victims are more vulnerable to diverse mental health problems, it is also true that not all abused children exhibit such problems.¹ Further, if any, they may present psychological problems of different profiles or severity. According to Korean government statistics,¹¹ abused children under protection services reported multiple emotional and behavioral problems, including depression, anxiety, inattention/hyperactivity, violent behavior, and delinquency. However, these statistics were simple counts of the number of abused children relevant to each problem domain without utilizing standardized measures. The outcome domains were not exhaustive enough to encompass the psychological problems (e.g., PTSD symptoms) manifested in this group.

Research on the psychological aspects of abused Korean children is limited, and most studies have investigated abuse-related variables in the general child population. There is a paucity of research on maltreated children because they are vulnerable participants with limited access to individual researchers. The difficulty in obtaining parental consent for study participation complicates the matter, considering that most offenders are the parents themselves. To our knowledge, an exceptional study by Ha et al.¹² examined the prevalence of mental disorders in abused children ($n=61$, mean age=10.0, boys=62.3%) in Gangwon-do, South Korea. In this study, approximately half (45.9%) of the abused children reported no salient psychological problems. The other half (50.8%) were

diagnosed with more than one mental disorder (attention-deficit/hyperactivity disorder, 23.0%; PTSD, 21.3%; depressive disorder, 16.4%; oppositional-defiant disorder 16.4%; conduct disorder, 8.2%), which was a much higher rate than that in the same age cohort (less than 8.0%).

Taking considerable heterogeneity into account, effective psychological intervention for maltreatment victims is possible only when their psychological state and the severity of problems are accurately assessed using reliable and valid measurement tools. Thus, developing a standardized and publicly available psychological scale with sound psychometric properties is essential to accumulating large-scale empirical data for evidence-based research and decision-making. A self-report scale is a viable option for this purpose. In general, self-reports have been widely utilized to screen high-risk groups requiring subsequent in-depth assessment or intervention, to measure symptom severity for treatment planning, and to monitor or determine the effect of treatment objectively.¹³ Furthermore, they are convenient and cost-effective, as literate respondents (above 2nd or 3rd graders in elementary school) can comprehend and answer independently with minimal help, and scoring and interpretation are relatively straightforward compared to clinician ratings or interviews. Furthermore, self-report scales provide helpful information on the internal state of children (e.g., emotional state and self-perception) that cannot be fully captured through observation or parental reports.^{14,15} Hence, if answered frankly, self-reports can serve as a valuable source of information to approach the subjective experiences of abused and neglected children, which cannot be overtly observed.

Although several self-report tools for children have been used in Korea, no single scale can comprehensively assess the vast array of psychological problems of maltreated children. Some widely-used self-reports focus on a specific topic—Korean Children's Depression Inventory; 2nd Edition,¹⁶ Revised Children's Manifest Anxiety Scale; 2nd Edition.¹⁷ Among the self-reports assessing psychological trauma, the Trauma Symptom Checklist for Children,¹⁸ Children's Response to Traumatic Scale; Revised (CRTES-R),¹⁹ or the Child Report of Post-traumatic Symptoms²⁰ are validated into Korean.²¹⁻²³ Although these self-report scales are well-established tools, they do not provide comprehensive coverage of psychological problems relevant to child maltreatment with an economic number of items. In contrast, the Child Behavior Checklist²⁴ and the Korean Personality Rating Scale for Children (KPRC)²⁵ are well-known comprehensive problem behavior checklists usually administered as parent-report versions. However, these parent-reported scales are inadequate for capturing the subjective experiences of maltreated children. Furthermore, these scales are insufficient to address trauma, as none have been developed

with a specific focus on assessing the psychological outcomes of child maltreatment. Additionally, most of these scales have copyright restrictions that limit their free use for public purposes.

Therefore, the present study primarily aimed to develop a self-report psychological scale that comprehensively evaluates emotional and behavioral problems and psychological trauma in abused children. Additionally, the newly developed scale was designed to include critical items (e.g., self-harm and suicide) for crisis intervention and an additional subscale of ego-resilience that acts as a protective factor. This multifaceted structure will increase its utility for multiple purposes, including screening, measuring symptom severity, and evaluating treatment effects.

METHODS

Item development and pilot study

Overall, scale development was conducted in three steps: item development, a pilot study, and validation of the final scale. First, the major domains and a large item pool were constructed. Based on an extensive literature review and existing data on psychological problem areas collected from maltreated children in Korea, the authors decided on three major domains: 1) emotional problems (depression and anxiety), 2) behavioral problems (inattention/hyperactivity/impulsivity, aggression/defiance), and 3) psychological trauma, which later comprised five subscales. Additionally, the minimum number of critical items for crisis intervention was considered. In addition to these problematic subscales concerning psychological symptoms, ego-resilience subscale was constructed to assess positive aspects and strengths, as well as negative aspects and weaknesses, which would be a meaningful construct to be assessed both as a psychological resource of a child regardless of maltreatment exposure and as a treatment outcome to be promoted.

In this item construction step, 135–175 items per subscale were included in the item pool. By applying three deicing rules, which are 1) theoretically central constructs in each subscale (e.g., Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [DSM-5] diagnostic criteria), 2) clinical features implicated in previous literature (e.g., developmental considerations), and 3) roughly equivalent number of items to be included per subscale, the authors chose 72 items through consensus. A group of experts (two clinical psychologists, two agents working in a child protection agency, and one pediatric psychiatrist; years of working experience, $M=17.2$) confirmed the adequacy of the overall composition of the scale and all preliminary items. Based on their suggestions, the authors added one item and modified the wording of the instructions, Likert options, and items, creating a preliminary

scale of 73 items.

In the next step of the pilot study, 72 children (maltreated children, $n=61$; non-maltreated children, $n=11$) answered the preliminary scale. They were children aged 9 to 15 years, attending from 3rd grade in elementary school to 3rd grade in middle school. Approximately half of the participants were boys ($n=35$, 48.6%), and more elementary school students (63.8%) were recruited to assess the readability and validity of the preliminary scale. Based on the descriptive statistics, reliability measures, discrimination and difficulty parameters, and item information curve obtained from the item response theory model, as well as parallel analysis results and factor loading patterns from exploratory factor analysis, and model fit indices from confirmatory factor analysis (CFA) in combination with theoretical importance, the authors eliminated 17 items, resulting in 56 items for the final scale. To reduce the respondent burden and represent each construct equally, the five major subscales of psychological symptoms consisted of ten items in addition to two critical items (intent for self- or other-harm, suicide) and 4 items belonging to the ego-resilience subscale. The expert group again rated the adequacy of each item to conclude that the revised final scale had improved compared to the preliminary version.

Participants

In the final step, 205 children aged 9–15 years participated in data collection between late October and early December 2022. Maltreated children ($n=157$, 76.6%) were recruited from 25 child protection agencies nationwide. They completed a self-report package, including the developed scale and other measures for validity checks. A child protection agent in charge of the child's case responded to a separate document that contained maltreatment- or treatment-related variables such as onset, duration, and type of maltreatment and whether the child was receiving psychiatric medication or psychotherapy. For a group comparison of the developed scale scores, a small sample of non-maltreated children who did not have a pronounced history of maltreatment was also recruited from schools and churches, and they answered the developed scale only. Informed consent was obtained from both the child and the parent, and all materials and procedures of this study were approved by the Institutional Review Board of Kyungpook National University (KNU-2022-0286). Participants' characteristics are presented in Table 1.

Measures

Mental Health Scale for Maltreated Children

The final 56 items constituted the Mental Health Scale for Maltreated Children (MHS-MC). Five subscales were de-

Table 1. Sample characteristics of participants (N=205)

	Maltreated children (N=157)	Non-maltreated children (N=48)
Sex		
Boy	76	20
Girl	81	28
School		
Elementary (3–6 grade)	93	28
Middle (1–3 grade)	64	20
Type of maltreatment		
PA	22	-
EA	43	-
SA	5	-
N	9	-
PA+EA	62	-
PA+N	3	-
EA+N	1	-
PA+EA+SA	3	-
PA+EA+N	1	-
PA+EA+SA+N	8	-
Current status		
Family-of-origin protection	113	-
Sent back home	14	-
Separated	30	-
Classified as a high-risk case		
Yes	17	-
No	137	-
Unknown	3	-
Referred to head psychological support team		
Yes	4	-
No	150	-
Unknown	3	-
Psychiatric medication		
Yes	15	-
No	139	-
Unknown	3	-
Psychotherapy		
Scheduled/not started yet	8	-
Ongoing	36	-
Terminated	39	-
Not applicable	74	-
Age when the first maltreatment occurred (yr)	9.63±3.07	-
Duration of maltreatment (month)	23.9±30.10	-

Values are presented as mean±SD or number. PA, physical abuse; EA, emotional abuse, SA, sexual abuse, N, neglect; SD, standard deviation

signed to encompass internalizing (depression and anxiety) and externalizing (inattention/hyperactivity/impulsivity and aggression/defiance) problems particularly relevant to child maltreatment. Additionally, two critical items for crisis intervention and five items for the supplementary subscale of ego-resilience were included so that this scale could be used for multiple purposes. The items were answered on a 4-point Likert scale (0=not at all, 1=somewhat, 2=considerably, 3=very much) based on experience over the past two weeks. Generally, higher scores indicate higher levels of each construct. If one answered equal to or above 1 on any critical items, immediate intervention was necessary regardless of scores of other symptom subscales.

Korean Personality Rating Scale for Children-Child Report Form (KPRC-CRF)

To verify convergent and divergent validity, we used subscales of the self-reported version of the KPRC—depression, anxiety, hyperactivity, delinquency, and ego-strength—corresponding to the constructs measured by the MHS-MC to verify convergent and divergent validity. Each subscale comprises 13–19 items rated on a 4-point Likert scale. The internal consistency was acceptable in this study (Cronbach's $\alpha=0.88$ for depression, $\alpha=0.87$ for anxiety, $\alpha=0.85$ for hyperactivity, $\alpha=0.80$ for delinquency and $\alpha=0.84$ for ego-strength).

Korean version of the Children's Response to Traumatic Events-Revised (K-CRTEs-R)

The CRTEs was initially developed to assess PTSD symptoms in line with the DSM-IV diagnostic criteria (intrusion, avoidance) among children aged 6 to 18,²⁶ and later revised by adding hyperarousal items.¹⁹ The CRTEs-R consists of 23 items, asking about the frequency of PTSD symptoms over the past week on a 4-point Likert scale (0=not at all, 1=seldom, 3=sometimes, 5=often). The Korean version was validated by Jeong et al.²² Internal consistency was excellent (Cronbach's $\alpha=0.95$) in this study.

Statistical analyses

Descriptive statistics for the MHS-MC were calculated. Then, Cronbach's α of each subscale and item-to-total correlations were calculated to assess the internal consistency. Subsequently, CFA was conducted for maltreated children ($n=157$) to examine the scale's construct validity. Before conducting CFA, Mardia's test for multivariate normality was conducted. The results revealed a skewness estimate of 2,301 ($p<0.001$) and a kurtosis estimate of 3,662 ($p<0.001$), indicating a violation of multivariate normality for the dataset.

Given the ordinal nature of the items in this study, CFA was conducted using diagonally weighted least squares (DWLS)

estimator with a polychoric correlation matrix. This approach provides more precise parameter and standard error estimates for non-normal data, particularly when sample sizes are modest, and indicators are not highly skewed.²⁷⁻³⁰ The hypothesized CFA model was composed of five factors: depression, anxiety, inattention/hyperactivity/impulsivity, aggression/defiance, and psychological trauma, with 10 observable indicators for each factor, while the indicators for measuring ego-resilience and critical items were not included in the model.

When conducting the CFA, several fit indices were utilized to compare the goodness-of-fit, including the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Clear cutoff values for CFI, RMSEA, and SRMR have not yet been established, particularly when using the DWLS estimator.³¹ However, a simulation study has indicated that there are no significant differences in CFI values between the maximum likelihood (ML) and DWLS estimator, whereas RMSEA and SRMR based on DWLS tend to be inflated when compared to values obtained through ML.³² Furthermore, their findings demonstrated that an increasing number of latent factors is associated with a decrease in CFI as well as an increase in RMSEA and SRMR values. Based on these simulation results and other related studies³³ conventional criteria to evaluate the model fit based on CFI (acceptable fit ≥ 0.90 , good fit ≥ 0.95), RMSEA, and SRMR (acceptable fit ≤ 0.08 , good fit ≤ 0.05) were applied in this study.^{34,35}

Furthermore, logistic regression analysis was conducted to determine how the MHS-MC scores predicted the likelihood of belonging to the maltreated children group while controlling for demographic factors including age and sex. The dependent variable was children's group membership, representing whether they were in the maltreated group, and the predictor was the overall MHS-MC score across five domains: depression, anxiety, inattention/hyperactivity/impulsivity, aggression/defiance, and psychological trauma.

Pearson's correlation analyses were conducted to evaluate the criterion-related validity of the MHS-MC. Specifically, the associations between the MHS-MC subscales and other scales were calculated to assess the convergent and divergent validity of the MHS-MC subscales. All analyses were conducted using Mplus 8.4 (Muthén & Muthén, Los Angeles, CA, USA).³⁶

RESULTS

Reliability

Table 2 presented the descriptive statistics, including the median, skewness, and kurtosis, for both maltreated and non-maltreated children. Moreover, internal consistency measures of the MHS-MC, Cronbach's α of each subscale and item-to-

Table 2. Descriptive statistics of the MHS-MC items (N=205)

No.	Maltreated children (N=157)			Non-maltreated children (N=48)		
	Median	Skewness	Kurtosis	Median	Skewness	Kurtosis
1	1.00	1.17	1.01	0.00	0.76	-0.37
2	2.00	1.28	0.71	1.00	0.46	-0.60
3	1.00	0.57	-0.76	2.00	0.24	-0.74
4	2.00	1.53	1.30	2.00	1.08	0.11
5	1.00	1.96	3.48	1.00	2.07	2.39
6	1.00	1.73	2.08	1.00	3.29	10.30
7	1.00	2.65	6.64	1.00	3.86	14.90
8	1.00	1.73	2.36	1.00	1.47	1.32
9	1.00	0.90	-0.22	1.00	0.97	0.12
10	2.00	1.39	1.30	1.50	1.52	1.33
11	1.00	0.87	-0.35	1.00	1.11	1.09
12	2.00	1.03	-0.05	2.00	1.24	0.94
13	1.00	0.39	-0.85	1.00	0.36	-0.94
14	2.00	0.85	-0.31	2.00	0.18	-0.94
15	2.00	0.54	-0.92	2.00	0.30	-0.94
16	2.00	0.85	-0.28	2.00	0.45	-0.82
17	2.00	0.70	-0.80	2.00	0.49	-0.95
18	2.00	0.75	-0.67	2.00	0.74	-0.36
19	2.00	1.36	1.15	2.00	1.22	0.87
20	1.00	0.97	0.05	1.00	1.06	0.39
21	2.00	1.79	2.11	1.00	3.06	9.90
22	1.00	2.26	4.19	1.00	2.38	5.35
23	1.00	0.63	-1.04	1.00	1.10	0.11
24	2.00	0.96	0.29	1.00	1.49	1.53
25	2.00	0.48	-1.03	1.00	0.69	-0.53
26	2.00	1.54	1.60	2.00	2.00	3.76
27	1.00	0.52	-0.90	1.00	0.94	0.58
28	2.00	1.01	0.32	2.00	1.25	1.64
29	2.00	0.81	-0.56	1.00	0.99	-0.18
30	2.00	0.81	-0.64	1.00	1.20	0.89
31	2.00	0.39	-1.22	2.00	1.04	1.57
32	2.00	0.41	-1.12	2.00	1.14	0.51
33	2.00	2.87	8.77	1.00	2.68	5.38
34	1.00	1.28	0.53	1.00	2.01	4.34
35	1.00	0.92	-0.32	1.00	1.46	2.08
36	1.00	0.92	0.55	1.00	0.84	2.60
37	2.00	2.68	6.99	2.00	2.65	6.91
38	1.00	3.08	9.37	1.00	2.76	9.84
39	1.00	1.61	1.90	1.00	2.21	5.10
40	1.00	1.50	1.98	1.00	1.76	2.40
41	1.00	1.16	0.81	1.00	1.47	1.32
42	2.00	0.76	-0.43	1.00	1.60	2.64

Table 2. Descriptive statistics of the MHS-MC items (N=205) (continued)

No.	Maltreated children (N=157)			Non-maltreated children (N=48)		
	Median	Skewness	Kurtosis	Median	Skewness	Kurtosis
43	2.00	1.11	0.09	1.00	2.41	6.81
44	1.00	0.96	-0.38	1.00	1.26	0.99
45	1.00	0.84	-0.62	1.00	1.25	1.26
46	1.00	1.26	0.55	1.00	1.85	1.47
47	1.00	0.65	-0.97	1.00	1.45	1.36
48	2.00	0.86	-0.52	1.00	1.29	0.40
49	2.00	1.85	2.38	1.00	2.25	4.43
50	1.00	1.47	1.05	1.00	2.15	4.14
51	1.00	1.35	0.84	1.00	2.56	7.59
52	1.00	0.76	-0.72	1.00	1.61	2.10
53	2.00	0.18	-1.04	1.00	-0.24	-0.78
54	2.00	0.26	-1.10	3.00	-0.36	-0.78
55	2.00	-0.15	-1.37	3.00	0.00	-0.98
56	3.00	-0.23	-1.32	3.00	-0.31	-0.97

MHS-MC, Mental Health Scale for Maltreated Children

total correlations were presented in Table 3. The internal consistencies of all subscales belonged to good to excellent range (0.81 for critical items to 0.91 for anxiety, inattention/hyperactivity/impulsivity, and psychological trauma). Moreover, when item-total correlations were examined within each subscale, all correlation coefficients were significant and strong above 0.5 ($r=0.52$ [item 7] to 0.80 [item 16]), providing support for the reliability of the MHS-MC.

Construct validity

CFA was conducted to ensure the construct validity of the constructs of interest. The hypothesized five-factor model provided an adequate fit to the data ($\chi^2=1,496.58$, $df=1,165$, $CFI=0.956$, $RMSEA=0.043$, $SRMR=0.076$). with CFI greater than 0.95 and RMSEA and SRMR smaller than 0.8. Table 4 showed that all the factor loadings were significantly and loaded onto their corresponding factors. Standardized factor loadings ranged from 0.558 to 0.928, and the mean and standard deviation of those loadings were 0.76 and 0.07, respectively.

Table 5 presented the correlations among the five factors in the CFA model. The correlations ranged from 0.50 to 0.87, with the mean and standard deviation of 0.72 and 0.10, respectively. These results provided evidence that the five-factor model was appropriate for explaining the factor structure of the MHS-MC subscales.

Concurrent validity

As shown in Table 6, a total score of the MHS-MC across

the five subscales (depression, anxiety, inattention/hyperactivity/impulsivity, aggression/defiance, and psychological trauma) significantly influenced the likelihood of belonging to the maltreated children group in logistic regression, controlling for the effects of age and sex ($\beta=0.019$, $p=0.015$). Specifically, a one-point increase in the total score resulted in a probability increase of belonging to the maltreated children group by a 1.019 odds ratio compared with the non-maltreated children group.

Criterion-related validity

As shown in Table 7, correlational analyses were performed between the six subscales of the MHS-MC except for the critical items and related scales. Overall, convergent and divergent validity were adequate. The depression, anxiety, inattention/hyperactivity/impulsivity, aggression/defiance, and ego-resilience subscales showed relatively higher associations with the corresponding and conceptually adjacent scales. For instance, internalizing subscales (depression, anxiety) were more closely related to each other ($r=0.72-0.79$, $p<0.001$). The inattention/hyperactivity/impulsivity subscale was more strongly associated with KPRC-hyperactivity ($r=0.70$, $p<0.001$) than KPRC-delinquency ($r=0.54$, $p<0.001$). The newly developed ego-resilience subscale also demonstrated a greater negative correlation with psychological trauma ($r=-0.40$, $p<0.001$) than with KPRC-ego-strength ($r=-0.20$, $p<0.01$). Of exception, in case of psychological trauma subscale, its highest correlation was with anxiety (KPRC-anxiety, $r=0.73$, $p<0.001$), although it was also strongly associated with psychological trauma (K-CRTES-R, $r=0.65$, $p<0.001$).

DISCUSSION

The main purpose of this study was to develop and validate a standardized self-report questionnaire that comprehensively assesses emotional and behavioral problems and psychological trauma in maltreated children in Korea. In particular, it is worth emphasizing that this was the initial attempt to devise a comprehensive psychological assessment tool based on data collected from maltreated Korean children nationwide, while most previous studies translated questionnaires developed in other countries into Korean for validation purposes.

In this study, the MHS-MC demonstrated sound psychometric properties. The reliability ranged from good to excellent. Construct validity was supported by a five-factorial solution for depression, anxiety, inattention/hyperactivity/impulsivity, aggression/defiance, and psychological trauma in the CFA. Additionally, concurrent validity was confirmed in that higher total scores were associated with a significantly higher likelihood of allocation to the maltreated group than to the non-

Table 3. Reliability of the MHS-MC items (N=205)

No.	Subscale (Cronbach's α)	Item	Cronach's α if deleted	Item-to-total correlation
1	Depression ($\alpha=0.90$)	Sadness	0.89	0.63
2		Pessimism	0.89	0.72
3		Irritability	0.89	0.65
4		Self-hatred	0.89	0.70
5		Not being liked by others	0.89	0.77
6		Appetite loss	0.90	0.58
7		Diminished social interest	0.90	0.52
8		Anhedonia	0.89	0.66
9		Fatigue	0.90	0.62
10		Low self-confidence	0.89	0.74
11	Anxiety ($\alpha=0.91$)	Worry if something bad happens	0.90	0.66
12		Frequent somatic complaints	0.90	0.65
13		Indecisiveness	0.90	0.69
14		Fear	0.90	0.63
15		Worry about mistakes	0.90	0.69
16		Tension	0.89	0.80
17		Timidity	0.90	0.62
18		Social anxiety	0.90	0.72
19		Stranger anxiety	0.90	0.63
20		Getting startled	0.90	0.65
21	Critical items ($\alpha=0.81$)	Self-injury or suicide	-	0.68
22		Harming oneself or others	-	0.68
23	Inattention/hyperactivity/impulsivity ($\alpha=0.91$)	Hyperactivity	0.90	0.65
24		Action without premeditation	0.90	0.64
25		Talkativeness	0.91	0.55
26		Trouble waiting for one's turn	0.90	0.67
27		Forgetting things to do	0.90	0.66
28		Failing to finish things	0.90	0.66
29		Inconcentration	0.89	0.77
30		Distractibility	0.89	0.80
31		Thinking of something else in class	0.90	0.63
32		Disliking tasks requiring sustained attention	0.90	0.70
33	Aggression/defiance ($\alpha=0.88$)	Bullying others	0.88	0.59
34		Burning with a rage	0.87	0.69
35		Difficulty controlling anger	0.87	0.66
36		Lying	0.87	0.66
37		Damaging properties	0.88	0.57
38		Physical violence	0.88	0.57
39		Verbal violence	0.87	0.70
40		Breaking the rules	0.87	0.64
41		Arguing with adults	0.87	0.60
42		Being scolded often	0.88	0.54

Table 3. Reliability of the MHS-MC items (N=205) (continued)

No.	Subscale (Cronbach's α)	Item	Cronach's α if deleted	Item-to-total correlation
43	Psychological trauma ($\alpha=0.91$)	Nightmares	0.90	0.66
44		Intrusive, distressing thoughts or images	0.90	0.67
45		Unwanted, repetitive thoughts	0.90	0.75
46		Changed world view	0.91	0.59
47		Trying not to remember the event	0.90	0.73
48		Avoiding reminders of the event	0.90	0.65
49		Re-experience	0.90	0.68
50		Heightened startle response	0.90	0.69
51		Psychic numbing	0.90	0.60
52		Vivid memory of the event	0.90	0.71
53	Ego-resilience ($\alpha=0.85$)	Optimism	0.81	0.68
54		Emotional stability	0.84	0.62
55		Self-efficacy	0.79	0.74
56		Sense of self as good-enough	0.79	0.72

MHS-MC, Mental Health Scale for Maltreated Children

maltreated group.

The criterion-related validity was generally satisfactory, exhibiting significant correlations with relevant measures in the expected direction. Notably, the new scale had fewer items per subscale (10 items in the case of the five primary symptom subscales and only four items for the ego-resilience subscale), indicating that it can be an economical alternative with reduced time and effort on the part of the respondent. With broader coverage, this can be a practical strength for vulnerable participants, such as maltreated children. Moreover, the newly developed ego-resilience subscale showed a larger negative correlation with psychological trauma than the existing KPRC-ego-strength, which showed only a weak negative correlation. This may suggest that the new subscale items possess better validity as indicators of ego-resilience, which buffers against psychological problems after trauma exposure.^{37,38} Altogether, the results demonstrated that the MHS-MC can be utilized as a reliable and valid self-report questionnaire for psychological assessment of maltreated children in Korea.

As previously mentioned, we are also aware of that there are other scales that either measure traumatic response of maltreated children, originally developed in the West, or measure mental health of general children. The comparative advantages of this newly developed MHS-MC can be summarized as follows. First, it can assess a wide range of psychological constructs that is particularly relevant to maltreated children; therefore, one can comprehensively measure the psychological profile of maltreated children with a single scale with an economic number of items. Second, the MHS-MC was developed for non-profit, public use in mind, different from other scales

with copyright issues, which restricts their availability in public settings with limited budget. Therefore, the MHS-MC can be freely distributed nationwide and utilized as a publicly-available, standard measure of maltreated children without legal or financial concerns.

Furthermore, it is worth noting that the MHS-MC possesses a few important clinical and practical implications. First, the MHS-MC can be basically used to assess the current psychological state of maltreated children. Maltreated children may exhibit various psychological symptoms with differing profiles, depending on the individual and situation.^{1,39} For example, some may have prominent complaints of emotional problems such as depression and anxiety, while others may display high levels of behavioral problems such as distractibility and/or aggression. Therefore, a comprehensive assessment covering a range of major domains is essential. In particular, results of this comprehensive assessment can point to domains of interest for subsequent in-depth assessment and intervention planning tailored to individual needs of maltreated children.

Second, the MHS-MC will help judge the severity level of the psychological after-effects, including identifying high-risk groups in need of urgent intervention. Severity judgment can be critical, especially when public resources are prioritized. As described previously, two critical items—intention to self-harm/harm others and suicide—are included in the MHS-MC. Responses equal to or above 1 (somewhat) on any critical items were thought to signify that immediate intervention was necessary, regardless of the sum of the scores of other symptom subscales. Although approximate severity judgment is possi-

Table 4. Standardized factor loadings for five factor model of the MHS-MC (N=157)

No.	Subscale	Item	Loadings	SE	p
1	Depression	Sadness	0.783	0.044	<0.001
2		Pessimism	0.874	0.033	<0.001
3		Irritability	0.811	0.036	<0.001
4		Self-hatred	0.767	0.047	<0.001
5		Not being liked by others	0.886	0.035	<0.001
6		Appetite loss	0.703	0.061	<0.001
7		Diminished social interest	0.731	0.066	<0.001
8		Anhedonia	0.729	0.059	<0.001
9		Fatigue	0.715	0.056	<0.001
10		Low self-confidence	0.867	0.032	<0.001
11	Anxiety	Worry if something bad happens	0.851	0.034	<0.001
12		Frequent somatic complaints	0.803	0.037	<0.001
13		Indecisiveness	0.819	0.035	<0.001
14		Fear	0.765	0.041	<0.001
15		Worry about mistakes	0.734	0.040	<0.001
16		Tension	0.845	0.031	<0.001
17		Timidity	0.720	0.046	<0.001
18		Social anxiety	0.797	0.034	<0.001
19		Stranger anxiety	0.727	0.049	<0.001
20		Getting startled	0.752	0.042	<0.001
23	Inattention/hyperactivity/impulsivity	Hyperactivity	0.724	0.046	<0.001
24		Action without premeditation	0.735	0.049	<0.001
25		Talkativeness	0.558	0.064	<0.001
26		Trouble waiting for one's turn	0.792	0.046	<0.001
27		Forgetting things to do	0.737	0.044	<0.001
28		Failing to finish things	0.829	0.035	<0.001
29		Inconcentration	0.891	0.028	<0.001
30		Distractibility	0.875	0.029	<0.001
31		Thinking of something else in class	0.759	0.046	<0.001
32		Disliking tasks requiring sustained attention	0.811	0.035	<0.001
33	Aggression/defiance	Bullying others	0.747	0.798	<0.001
34		Burning with a rage	0.826	0.897	<0.001
35		Difficulty controlling anger	0.822	0.928	<0.001
36		Lying	0.799	0.708	<0.001
37		Damaging properties	0.765	0.833	<0.001
38		Physical violence	0.774	0.817	<0.001
39		Verbal violence	0.793	0.867	<0.001
40		Breaking the rules	0.779	0.842	<0.001
41		Arguing with adults	0.656	0.744	<0.001
42		Being scolded often	0.780	0.703	<0.001

Table 4. Standardized factor loadings for five factor model of the MHS-MC (N=157) (continued)

No.	Subscale	Item	Loadings	SE	p
43		Nightmares	0.798	0.044	<0.001
44		Intrusive, distressing thoughts or images	0.897	0.029	<0.001
45		Unwanted, repetitive thoughts	0.928	0.024	<0.001
46		Changed world view	0.708	0.062	<0.001
47	Psychological trauma	Trying not to remember the event	0.833	0.034	<0.001
48		Avoiding reminders of the event	0.817	0.037	<0.001
49		Re-experience	0.867	0.044	<0.001
50		Heightened startle response	0.842	0.042	<0.001
51		Psychic numbing	0.744	0.060	<0.001
52		Vivid memory of the event	0.703	0.050	<0.001

MHS-MC, Mental Health Scale for Maltreated Children; SE, standard error

Table 5. Factor correlations between five factors of the MHS-MC (N=157)

	DEP	ANX	IN/HY/IM	AG/DEF	PT
DEP					
ANX	0.87***				
IN/HY/IM	0.76***	0.67***			
AG/DEF	0.78***	0.73***	0.83***		
PT	0.69***	0.79***	0.50***	0.59***	

***p<0.001. MHS-MC, Mental Health Scale for Maltreated Children; DEP, depression; ANX, anxiety; IN/HY/IM, inattention/hyperactivity/impulsivity; AG/DEF, aggression/defiance; PT, psychological trauma

ble based on the relative standings of raw scores (e.g., Z score), a more valid interpretation would be feasible based on subscale and/or total scores if more data are accumulated to establish a representative norm in the near future.

Third, the MHS-MC would be utilized to evaluate treatment outcomes. This scale can be administered before and after a psychological intervention to assess the effect of psychological intervention and determine when to terminate. Several kinds of psychological interventions, such as trauma-focused cognitive behavioral therapy, are known to be effective for children with traumatic experiences, including childhood maltreatment.^{40,41} Treatment outcome evaluation should be extensive, considering both symptom reduction and resource building. Naturally, the primary goal of treatment would be to alleviate distressing symptoms; however, bolstering coping resources would be equally essential to prevent the mental health problems of maltreated children in the long run.⁴² Five symptom subscales of the MHS-MC comprise representative internalizing and externalizing symptoms in childhood and adolescence, while the complementary subscale of ego-resilience corresponds to coping resources. The multifaceted structure of MHS-MC makes it possible to address both sides of treat-

Table 6. Logistic regression analysis for child membership prediction (N=205)

Variables	Model 1		Model 2	
	Estimates (SE)	Odds ratio	Estimates (SE)	Odds ratio
Intercept	1.241 (1.15)	3.459	0.041 (1.28)	1.042
Age	0.032 (0.09)	1.033	0.022 (0.09)	1.023
Sex	-0.283 (0.34)	0.641	-0.445 (0.35)	0.641
Total Score			0.019* (0.01)	1.019
Nagelkerke R ²	0.003		0.056	

Total score indicates the sum score of subscales including depression, anxiety, inattention/hyperactivity/impulsivity, aggression/defiance and psychological trauma. *p<0.05. SE, standard error

ment outcomes.

Limitations

This study has a few limitations. First, the sample size and representativeness could be criticized. A total of 157 maltreated children whose parents provided voluntary consent participated in this study. Probably due to the practical difficulty of obtaining parental consent, only 61 to 73 maltreated children participated in previous research and were recruited from only one region.^{12,21} Thanks to cooperation from child protection agencies in conjunction with the National Center for the Rights of the Child, more than double the number of maltreated child participants were recruited nationwide in the present study. However, the relatively small sample size made conducting receiver operating curve analysis challenging to determine the cutoff scores for identifying high-risk groups. Moreover, considering that maltreated children excluded from the study because of the absence of parental consent tended to experience more severe maltreatment,⁹ the present results may not be generalizable to this subgroup. Therefore, it is necessary to test the psychometric properties of the MHS-MC in

Table 7. Correlation between the MHS-MC and other scales (N=205)

	MHS-MC						
	Total	DEP	ANX	IN/HY/IM	AG/DEF	PT	ERS
MHS-MC							
DEP	0.86***						
ANX	0.86***	0.73***					
IN/HY/IM	0.82***	0.64***	0.55***				
AG/DEF	0.83***	0.67***	0.61***	0.74***			
PT	0.77***	0.56***	0.63***	0.46***	0.48***		
ERS	-0.55***	-0.61***	-0.50***	-0.43***	-0.43***	-0.40***	
KPRC-DEP	0.80***	0.79***	0.73***	0.61***	0.61***	0.60***	-0.56***
KPRC-ANX	0.81***	0.72***	0.79***	0.53***	0.57***	0.73***	-0.52***
KPRC-HPR	0.69***	0.54***	0.54***	0.70***	0.63***	0.46***	-0.42***
KPRC-DLQ	0.69***	0.56***	0.60***	0.54***	0.72***	0.49***	-0.43***
K-CRTE-R	0.56***	0.46***	0.39***	0.38***	0.44***	0.65***	-0.29***
KPRC-ES	-0.48***	-0.60***	-0.44***	-0.40***	-0.41***	-0.20**	0.62***

p<0.01; *p<0.001. MHS-MC, Mental Health Scale for Maltreated Children; DEP, depression; ANX, anxiety; IN/HY/IM, inattention/hyperactivity/impulsivity; AG/DEF, aggression/defiance; PT, psychological trauma; ERS, ego-resilience; KPRC, Korean Personality Rating Scale for Children; HPR, hyperactivity; DLQ, delinquency; K-CRTE-R, Korean version of the Children's Response to Traumatic Events-Revised; ES, ego-strength

a larger, representative sample of maltreated children in future research. And it will be crucial to establish a standardized norm for norm-referenced interpretation.⁴³

Second, continued research is warranted to ensure the applicability of the MHS-MC as a standard scale for maltreated children. In addition to establishing a standardized norm, a few points should be primarily considered in such further validation. It would be necessary to conduct clinical studies recruiting maltreated children diagnosed with mental disorders via (semi) structured diagnostic interview. Also, as this study was cross-sectional, we could not examine sensitivity to changes of the MHS-MC, which requires repeated administration. Even a brief psychotherapy can take a few weeks or longer to complete. Subsequent research needs to compare the MHS-MC scores, at least between pre- and post-treatment time points, in a sufficient number of maltreated children to further examine sensitivity to change, an important criterion of the clinical utility of a scale.⁴⁴ This would also contribute to the scientific examination of whether supportive services, including psychotherapy, are effective for the recovery of maltreated children and how much improvement occurs in terms of cost-and-benefit analysis. If accumulated, this information would form the basis for evidence-based service provision, monitoring, and improvement.

Third, a few adaptations of this scale may further increase its utility. For example, we developed the MHS-MC for children aged 9–15 years, considering the minimum reading ability and prevalent age range in maltreatment cases. Children

under or over this age range constitute a considerable percentage of all maltreated children. Thus, extending the age range by modifying the item content appropriate for developmental levels would be helpful. In addition, a shortened version may be necessary. The present scale consists of 56 items in total and takes approximately 10 minutes to complete. Although the total number of items is not too high compared to the existing scales, it would be ideal to develop an additional briefer version with comparable reliability and validity, which can be utilized in situations with limited time or emergencies.

Conclusions

In summary, we aimed to develop a self-report scale that comprehensively assesses maltreated children's emotional, behavioral, and psychological trauma. Furthermore, we constructed a scale that could be used in various ways, such as for high-risk group screening and treatment outcome evaluation, by providing critical items for crisis intervention and additional measures of ego-resilience as a protective factor. This scale demonstrated promising psychometric properties despite the reduced number of items per subscale, indicating that it can be an economical and sound measurement tool. We believe that this scale will be conducive to identifying children suffering from psychological problems after maltreatment and will ultimately help provide appropriate intervention recommendations. It is hoped that continued standardization of the MHS-MC will be beneficial in guiding well-informed clinical and policy decision-making.

Availability of Data and Material

The datasets generated or analyzed during the study are not publicly available due to their containing information that could compromise the privacy of research participants but are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Bin-Na Kim, Hyo Shin Kang, Hyeseon Jo, Jungkyu Park. Data curation: Bin-Na Kim, Hyo Shin Kang, Hyeseon Jo, Soo-Yeon Kim, Ha-young Park. Formal analysis: Jungkyu Park, Suhyeon Kang. Funding acquisition: Hyo Shin Kang, Hyeseon Jo. Investigation: Hyo Shin Kang, Soo-Yeon Kim, Ha-young Park. Methodology: Jungkyu Park, Suhyeon Kang. Project administration: Hyo Shin Kang, Hyeseon Jo. Resources: Hyeseon Jo, Soo-Yeon Kim, Ha-young Park. Software: Jungkyu Park. Supervision: Hyo Shin Kang, Bin-Na Kim, Jungkyu Park. Validation: Bin-Na Kim, Hyo Shin Kang, Soo-Yeon Kim, Ha-young Park, Suhyeon Kang. Visualization: Bin-Na Kim, Hyo Shin Kang, Jungkyu Park. Writing—original draft: Bin-Na Kim, Hyo Shin Kang, Jungkyu Park. Writing—review & editing: Bin-Na Kim, Hyo Shin Kang, Jungkyu Park, Soo-Yeon Kim, Ha-young Park, Suhyeon Kang.

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