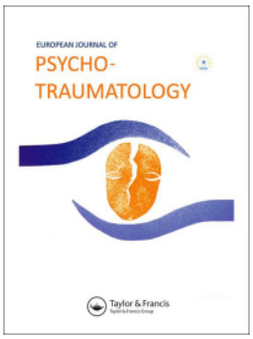

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BASIC RESEARCH ARTICLE

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Somatic symptoms among trauma-exposed North Korean defectors: prevalence, correlates, and implications

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ABSTRACT

Background: North Korean defectors (NKDs), a predominantly trauma-exposed population, are at high risk for somatic symptoms. Unrecognized and untreated somatic symptoms can profoundly affect health and psychosocial functioning. Therefore, it is crucial to understand and address somatic symptoms in the NKD population.

Objective: This study aimed to assess the prevalence of somatic symptoms and to identify and quantify their correlates among trauma-exposed NKDs.

Method: Cross-sectional survey data of 438 trauma-exposed NKDs in South Korea were analyzed. Participants completed a survey assessing somatic symptoms, sociodemographic, trauma-related (repatriation experience, trauma exposure, probable post-traumatic stress disorder [PTSD] and disturbances in self-organization [DSO]), health-related (physical activity), and social (loneliness and perceived discrimination) characteristics.

Results: Overall, 42 of the 438 NKDs reported moderate-to-severe somatic symptoms. Multiple linear regression and relative importance analyses revealed that higher levels of loneliness ($\beta = 0.27$, $p < .001$; 25.2% relative variance explained [RVE]) was the strongest correlates of somatic symptoms, followed by older age ($\beta = 0.24$, $p < .001$; 17.2% RVE), probable PTSD ($\beta = 0.14$, $p = .001$; 14.6%), greater perceived discrimination ($\beta = 0.15$, $p = .001$; 14.5%), and probable DSO ($\beta = 0.10$, $p = .026$; 13.0% RVE).

Conclusions: This study provides evidence of the high severity of somatic symptoms among NKDs. Further research is needed to develop and test culturally appropriate interventions to address loneliness and perceived discrimination of NKDs, especially those with comorbid PTSD and DSO symptoms, to help mitigate somatic symptoms.

ARTICLE HISTORY

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KEYWORDS

Somatic symptoms; medically unexplained symptoms; North Korean defectors; refugees; trauma; relative importance

PALABRAS CLAVE

Síntomas somáticos; síntomas médicamente inexplicados; desertores de Corea del Norte; refugiados; trauma; importancia relativa

HIGHLIGHTS

- Somatic symptoms were examined in a trauma-exposed North Korean defectors (NKDs).
- Approximately 10% of NKDs reported moderate-to-severe somatic symptoms.
- Higher loneliness was the strongest correlate of somatic symptoms, followed by older age, probable PTSD, and greater perceived discrimination.

Síntomas somáticos en desertores de Corea del Norte expuestos al trauma: prevalencia, factores asociados e implicaciones

Antecedentes: Los desertores de Corea del Norte (DCN), una población predominantemente expuesta a trauma, presentan alto riesgo de síntomas somáticos. Los síntomas somáticos no reconocidos ni tratados pueden afectar profundamente la salud y el funcionamiento psicosocial. Por ello, es fundamental comprender y abordar los síntomas somáticos en esta población.

Objetivo: Evaluar la prevalencia de síntomas somáticos e identificar y cuantificar sus factores asociados en desertores de Corea del Norte expuestos a trauma.

Método: Se analizaron datos de una encuesta transversal de 438 desertores de Corea del Norte expuestos a trauma en Corea del Sur. Los participantes respondieron una encuesta que evaluó síntomas somáticos, características sociodemográficas, características relacionadas con el trauma (experiencia de repatriación, exposición a trauma, probable trastorno de estrés postraumático [TEPT] y alteraciones de la autoorganización [DSO por sus siglas en ingles]), características relacionadas con la salud (actividad física) y características sociales (soledad y discriminación percibida).

Resultados: En total, 42 de los 438 participantes reportaron síntomas somáticos de intensidad moderada a grave. Los análisis de regresión lineal múltiple y de importancia relativa mostraron que la soledad fue el factor asociado más importante de los síntomas somáticos ($\beta = 0,27$; $p < 0,001$; 25,2% de varianza relativa explicada [RVE por sus siglas en ingles]), seguida por mayor edad ($\beta = 0,24$; $p < 0,001$; 17,2% RVE), TEPT probable ($\beta = 0,14$; $p = 0,001$; 14,6%), mayor discriminación percibida ($\beta = 0,15$; $p = 0,001$; 14,5%) y DSO probable ($\beta = 0,10$; $p = 0,026$; 13,0% RVE).

Conclusiones: Este estudio aporta evidencia sobre la elevada gravedad de los síntomas somáticos entre los desertores de Corea del Norte. Se necesita más investigación para desarrollar y evaluar intervenciones culturalmente apropiadas que aborden la soledad y la discriminación percibida en esta población, especialmente en quienes presentan síntomas comórbidos de TEPT y DSO, con el fin de ayudar a mitigar los síntomas somáticos.

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Abbreviations: NKD, North Korean defector; RVE, relative variance explained; PTSD, post-traumatic stress disorder; DSSS, Depression and Somatic Symptoms Scale; ITQ, International Trauma Questionnaire; PTSD, post-traumatic stress disorder; DSO, disturbances in self-organization; MDD, major depressive disorder; SAM, sympathetic-adreno-medullar

1. Introduction

Somatic symptoms refer to physical complaints such as headache, muscle tension, and increased heart rate that may occur with or without identifiable medical causes. These symptoms are highly prevalent in the general population. For example, a population-based study in Denmark reported that 94.9% of respondents were bothered by at least one somatic symptom within the past 14 days (Eliasen et al., 2016). Importantly, greater somatic symptom burden has been prospectively associated with reduced physical functioning and lower health-related quality of life at 1-year follow-up (Creed et al., 2012). Contemporary models conceptualize somatic symptoms within a biopsychosocial framework, in which biological stress responses, psychological processes, and social-contextual factors interact to influence symptom perception and reporting (Creed et al., 2012; Engel, 1977). Given the biopsychosocial underpinnings of somatic symptoms, individuals exposed to trauma and chronic stress may be particularly vulnerable to elevated somatic symptom burden. Indeed, a prior work reported that individuals exposed to trauma were 2.7 times more likely to report functional somatic syndrome, a set of persistent and distressing physical symptoms with or without medical explanations (Afari et al., 2014).

North Korean defectors (NKDs) are a unique and vulnerable population exposed to significant distress and trauma (Jeon et al., 2008; Noh & Lee, 2020). Before defection, NKDs face food shortages and poverty in North Korea, which can lead to life-threatening hardships and unwanted separation from their families (Lim et al., 2024). During defection, they may experience human trafficking, forced repatriation to North Korea, and a sense of guilt that their family remaining in North Korea may face imprisonment and questioning (Kim et al., 2010; Lim et al., 2024). Even after defection, NKDs often experience acculturative stress due to discrimination and a lack of family cohesion (Park et al., 2018; Um et al., 2015). A previous study has reported that NKDs experienced an average of 8.9 lifetime traumatic events (Baek et al., 2022). Exposure to such stressors places NKDs at a heightened risk of a range of psychological symptoms (Sangalang et al., 2019). Previous studies have identified somatic symptoms as one of the most prevalent psychological symptoms (42.4%), followed by depressive (38.9%) and anxiety (34.0%) symptoms in NKDs (Kim et al., 2011a) and have shown their mediating role in the association between perceived social support and physical and mental health-related quality of life (Won et al., 2017).

The elevated burden of somatic symptoms among NKDs may be understood within a biopsychosocial framework. Extensive trauma exposure, chronic stress, and post-migration difficulties may contribute to heightened physiological stress responses and increased sensitivity to bodily sensations (Gonzalez-Guarda et al., 2021; Orr et al., 2002). Additionally, cultural norms and stigma surrounding mental health may influence how distress is expressed and communicated, potentially leading to greater reporting of physical symptoms (Hong, 2015; Kim et al., 2018; Kim & Kim, 2016). These complex interactions may also shape healthcare-seeking behaviors, including preferences for non-psychiatric medical services and dissatisfaction with available treatments in South Korea (Hong, 2015; Kang et al., 2012). Given these unique patterns, a comprehensive understanding of somatic symptoms in NKDs is crucial to improving their access to appropriate care and overall health outcomes.

However, empirical evidence on the prevalence and correlates in NKDs remains limited. Prior research in other populations has identified a broad range of factors associated with somatic symptoms. These factors included sociodemographic characteristics such as age, sex, and employment status (Barsky et al., 2001; Hamdan-Mansour, 2017; Kang et al., 2024); trauma-related characteristics such as repatriation status, trauma exposure, and posttraumatic stress (PTSD) (Gupta, 2013; Morina et al., 2018); health-related characteristics such as physical activity (Hoerster et al., 2012); and social characteristics such as loneliness and discrimination (Hutten et al., 2021; Loeb et al., 2018). However, given the distinct sociopolitical and migration-related experiences of NKDs, the applicability of these correlates remains unclear. In that regard, examining these correlates within NKD population may help identify individuals at particularly higher risk, reveal protective and risk factors for these symptoms, and inform culturally appropriate interventions.

Therefore, this study aimed to assess the prevalence of somatic symptoms among trauma-exposed NKDs and to identify and quantify their correlates. The findings of this study will help inform targeted interventions and policies to improve the health and well-being of the NKD population.

2. Material and methods

2.1. Data source and participants

We analyzed data from a cross-sectional survey conducted between August 2021 and October 2021 to validate the International Trauma Questionnaire for assessing PTSD and complex PTSD among trauma-exposed NKD population (Baek et al., 2022). Participants were recruited both online and offline via snowball sampling, with assistance from key personnel within NKD communities and centers providing psychological counseling services to NKDs. Eligible participants were NKDs aged 19 years and older and who had experienced at least one traumatic event.

Participants received a survey link via a smartphone messaging application and, after providing electronic informed consent, completed questionnaires assessing sociodemographic, trauma-related, health-related, and psychosocial characteristics. In the parent study, 520 participants initially provided consent and completed the survey, and 17 participants with no exposure to traumatic events were excluded, as trauma exposure is a prerequisite for the assessment of PTSD and complex PTSD. After excluding additional 65 participants who did not complete the questionnaires on key variables, 438 participants were included in the final sample.

2.2. Assessments

2.2.1. Somatic symptoms

Somatic symptoms were assessed using the Korean version of the Depression and Somatic Symptoms Scale – Somatic subscale, which includes 10 items, such as headache, back pain, chest pain, and muscle tension (Hung et al., 2006; Kim et al., 2011b). Participants reported the severity of each symptom experienced in the past week on a scale of 0 (absent) to 3 (severe). The items were summed to create a total score (range = 0–30), with higher scores indicating more severe symptoms. The Cronbach's alpha for this scale in our sample was 0.93.

2.2.2. Potential correlates of somatic symptoms

Sociodemographic variables included age, sex, and employment status. Age was assessed in years, and sex was categorized as male or female. Employment status was coded as currently employed versus not employed.

Trauma-related variables included repatriation experience, total trauma exposure, post-traumatic stress disorder (PTSD) symptoms, and disturbances in self-organization (DSO) symptoms. Repatriation experience – a distinct traumatic event that NKDs can experience – was coded as having experienced forcible repatriation to North Korea versus no such experience. Total trauma exposure was assessed using the 17-item Trauma Event Checklist for North Korean Defectors, developed by our study team, comprising four types of trauma exposure: death and life threatening events (six items assessing natural disaster, serious accident, sudden death of family/close friend, witnessing death of family/close friend, witnessing death of someone, and extreme hardship), family dissolution (four items assessing domestic violence, divorce, unwanted separation from family, and unwanted separation from child), interpersonal violence and mistreatment (four items assessing physical assault, discrimination, verbal abuse, and sexual assault), and violence by authorities (three items assessing threats to personal security, imprisonment, and torture). Participants reported whether they had experienced each traumatic event, and the total count of traumatic exposures was computed (range = 0–17). Please see Supplementary Table for the frequency of each trauma exposure in this sample. PTSD and DSO symptoms were assessed using the 18-item International Trauma Questionnaire (ITQ) (Cloitre et al., 2018), standardized for North Korean defectors (Baek et al., 2022). The ITQ includes three clusters each for PTSD and disturbances in self-organization (DSO), with each cluster comprising two items, as well as three items assessing functional impairment associated with symptoms of PTSD and DSO, respectively. The PTSD symptom clusters include re-experiencing, avoidance, and a sense of threat, and the DSO symptom clusters include affective dysregulation, negative self-concept, and disturbances in relationships. Participants reported the severity of each symptom on a scale of 0 (not at all) to 4 (extremely). Participants were classified as having probable PTSD if they scored 2 and above on (1) one of two items on each symptom cluster of PTSD (i.e. re-experiencing, avoidance, and a sense of threat), and (2) at least one indicator of functional impairment. Similarly, participants were classified as having probable DSO if they scored 2 and above on (1) one of two items of each symptom cluster of DSO (i.e. affective dysregulation, negative self-concept, and disturbances in relationships), and (2) at least one indicator of functional impairment. The Cronbach's alphas for ITQ are 0.92 for PTSD and 0.93 for DSO.

Health-related variables included physical activity, which was evaluated using the International Physical Activity Questionnaire (Craig et al., 2003). Based on the scoring guidelines (Forde, 2018), total physical activity – expressed as MET (Metabolic Equivalent of Task)-minutes per week – was calculated by multiplying standard MET values for walking (3.3 METs), moderate (4.0 METs), and vigorous activity (8.0 METs) by the reported minutes per day and days per week for each intensity level, and summing across

intensity levels. Due to the skewed distribution, total MET-minutes per week was categorized into tertiles for analysis.

Social variables included loneliness and perceived discrimination. Loneliness was assessed using the 20-item UCLA Loneliness Scale (Jin & Hwang, 2019; Russell, 1996). Participants reported their level of agreement with each item on a scale of 1 (never) to 4 (always). The total score for each item was computed (range = 4–80), with higher scores indicating greater levels of loneliness. The Cronbach's alpha for our sample was 0.93. Perceived discrimination was assessed using the 9-item Everyday Discrimination Scale (Kim et al., 2019; Williams et al., 1997), which includes experiences of unfair treatment and personal rejection. Participants indicated how often they experienced discrimination in their daily lives. For this study, we used the Korean version of the scale, which assesses participants' experiences on a 4-point Likert scale ranging from 1 (never) to 4 (often). The sum score for each item was computed (range = 9–36), with the Cronbach's alpha of 0.90 in our sample. Given the skewed distribution of perceived discrimination scores, the variable was categorized into quintiles.

2.3. Data analysis

Descriptive statistical analyses were conducted to derive frequencies, means, and standard deviations of the sample characteristics and somatic symptoms. For continuous variables, the linearity and normality of the residuals were checked through visual inspection of scatterplots and Q-Q plots. Independent t-tests and chi-squared tests were used to assess whether each variable was associated with the reporting of moderate-to-severe somatic symptoms.

Multiple linear regression analysis was conducted to identify independent correlates of somatic symptoms. Subsequently, a relative importance analysis – a statistical method used to assess the contribution of each independent variable to the overall explanatory power of the model (R^2) – was conducted to examine the relative variance explained by each significant correlate while considering the intercorrelations among variables (Tonidandel & LeBreton, 2011). In all analyses, $p < .05$ was considered statistically significant. Descriptive statistical analyses and multiple linear regression were performed using IBM SPSS Statistics 25 (IBM Corp., Armonk, NY, USA), and relative importance analysis was conducted using RWA-Web, which generates and runs R code for relative importance analysis (Tonidandel & LeBreton, 2015).

3. Results

Table 1 summarizes the sample characteristics. The mean score for somatic symptoms was 10.0 (SD = 6.8), with 42 of the 438 participants reporting moderate-to-severe somatic symptoms. The mean somatic symptom score of participants with none-to-slight somatic symptoms was 8.6 (SD = 5.5), whereas the mean score of those with moderate-to-severe somatic symptoms was 23.2 (SD = 2.9; $p < .001$).

Table 2 summarizes the results of the multiple linear regression. Somatic symptom scores were positively associated with age ($\beta = 0.239$, $p < .001$), female sex ($\beta = 0.201$, $p < .001$), unemployed status ($\beta = -0.080$, $p = .034$), probable PTSD ($\beta = 0.142$, $p = .001$) and DSO ($\beta = 0.104$, $p = .026$), loneliness ($\beta = 0.265$, $p < .001$), and perceived discrimination ($\beta = 0.145$, $p = .001$).

Figure 1 presents the results of the relative importance analysis. The majority (>84%) of the explained variance in somatic symptom scores was accounted for by higher levels of loneliness (25.2% relative variance explained [RVE], 95% CI = 16.7–34.3), older age (17.2% RVE, 95% CI = 9.7–26.0), probable PTSD (14.6% RVE, 95% CI = 8.4–22.2), greater perceived discrimination quintile (14.5% RVE, 95% CI = 8.4–21.8), and probable DSO (13.0% RVE, 95% CI = 6.9–20.0). Other significant variables included female sex (10.6% RVE, 95% CI = 5.1–17.7) and currently unemployed status (4.9% RVE, 95% CI = 1.5–10.3).

4. Discussion

To the best of our knowledge, this study provides the most up-to-date assessment of the prevalence and correlates of somatic symptoms among NKDs in South Korea. On average, participants reported mean somatic symptom scores of 10.0 out of 30, with 42 out of 438 participants reporting moderate-to-severe somatic symptoms. Higher loneliness was the strongest correlate of somatic symptom scores, followed by older age, probable PTSD, greater perceived discrimination, and probable DSO. The level of somatic symptoms is comparable to that of outpatients with lifetime or current major depressive disorders (MDD; mean = 10.1, $t = 0.171$, $p = .864$) (Jeon et al., 2016) as well as patients with new MDD (mean = 10.9, $t = 1.85$, $p = .07$) and non-remitted MDD (mean = 10.6, $t = 1.21$, $p = .23$) (Woo et al., 2014) in South Korea. This finding suggests psychiatric vulnerability in NKDs and highlights the severity of somatic symptoms in this population.

Notably, more than one-third (>39%) of the variance in somatic symptoms was explained by modifiable factors: loneliness and perceived discrimination. Previous studies have consistently shown a positive association between loneliness and somatic symptoms (Hutten et al., 2021; Tsur et al., 2019). For example, in a combined sample of patients with somatic symptom disorders and healthy participants, Hutten et al. (2021) showed that loneliness, both directly and indirectly via

Table 1. Sample characteristics.

Variables	Total Sample ($N = 438$) N (%) or Mean ± SD	None-to-slight Somatic Symptoms ($n = 396$) N (%) or mean ± SD	Moderate-to-severe Somatic Symptoms ($n = 42$) N (%) or mean ± SD	Statistical Tests p (F or χ^2)
DSSS-Somatic subscale score (0–30)	10.0 ± 6.8	8.6 ± 5.5	23.2 ± 2.9	<.001**
Age (years)	46.3 ± 12.8	45.6 ± 12.9	52.9 ± 9.6	<.001**
Female sex	372 (84.9%)	332 (83.8%)	40 (95.2%)	.050*
Currently employed	226 (51.6%)	211 (53.3%)	15 (35.7%)	.030*
Experience with repatriation	107 (24.4%)	94 (23.7%)	13 (31.0%)	.301
Total trauma exposure (0–17)	7.4 ± 3.9	7.2 ± 3.7	10.1 ± 4.1	<.001**
Death (0–6)	3.2 ± 1.9	3.1 ± 1.9	4.0 ± 1.8	.007**
Family dissolution (0–4)	1.7 ± 1.2	1.6 ± 1.1	2.4 ± 1.2	<.001**
Violence by individual (0–4)	1.2 ± 1.2	1.1 ± 1.1	2.1 ± 1.4	<.001**
Violence by public authorities (0–3)	1.3 ± 1.2	1.3 ± 1.2	1.7 ± 1.1	.019*
ITQ				
Probable PTSD	121 (27.6%)	91 (23.0%)	30 (71.4%)	<.001**
Probable DSO	88 (20.1%)	64 (16.2%)	24 (57.1%)	<.001**
Physical activity	575.6 ± 756.8	594.6 ± 767.4	396.8 ± 628.0	.107
First tertile	173 (39.5%)	154 (38.9%)	19 (45.2%)	.080
Second tertile	138 (31.5%)	121 (30.6%)	17 (40.5%)	
Third tertile	127 (29.0%)	121 (30.6%)	6 (14.3%)	
Loneliness	43.8 ± 12.0	43.0 ± 11.8	50.8 ± 11.6	<.001**
Perceived discrimination	12.4 ± 4.1	12.0 ± 3.6	16.5 ± 6.4	<.001**
First quintile	136 (31.1%)	130 (32.8%)	6 (14.3%)	<.001**
Second quintile	70 (16.0%)	67 (16.9%)	3 (7.1%)	
Third quintile	38 (8.7%)	35 (8.8%)	3 (7.1%)	
Fourth quintile	113 (25.8%)	104 (26.3%)	9 (21.4%)	
Fifth quintile	81 (18.5%)	60 (15.2%)	21 (50.0%)	

Note. Participants were classified as having none-to-slight symptoms if their mean DSSS-S score was < 2, and as having moderate-to-severe symptoms if their mean score was ≥ 2. DSSS, Depression and Somatic Symptoms Scale; ITQ, International Trauma Questionnaire; PTSD, post-traumatic stress disorder; DSO, disturbances in self-organization.
* $p < .05$, ** $p < .01$.

deficiencies in social support, predicted somatic symptoms. Although fewer studies have examined the association between perceived discrimination and somatic symptoms, Loeb et al. (2018) incorporated perceived discrimination into a lifetime adversity index and demonstrated its association with somatic symptom severity among African American and Latino adults in the United States, suggesting that discrimination-related stress may contribute to experience of somatic symptoms. One possible explanation of the observed associations is that loneliness and discrimination are sources of anxiety and depression, which are likely to foster somatosensory amplification – defined as the 'tendency to experience bodily sensation as intense, noxious, and disturbing' (Barsky, 1992). Anxiety increases self-consciousness and lowers the threshold for unpleasant bodily sensations, and depression increases attention to the inner self and makes trivial discomfort more noxious (Barsky, 1992), both of which ultimately foster the experience of somatic symptoms. Although the cross-sectional design precludes conclusions regarding directionality or mechanisms, these findings underscore the potential importance of social stressors in shaping experiences of somatic symptoms among NKDs. This is particularly relevant to NKD population, given that they often lack social networks in a new society, and traumatic experiences and separation from existing social connections are likely to exacerbate loneliness (Kim et al., 2023). They are also subject to prejudice and discrimination in the new society (Ko et al., 2004). Therefore, further efforts are needed to develop community- and societal-level strategies and interventions to strengthen the social connections of NKDs and combat discriminatory attitudes in Korean society.

Table 2. Results of multiple linear regression predicting somatic symptoms.

Variables	β	t	p
Age (years)	0.239	6.418	<.001**
Female sex	0.201	5.642	<.001**
Currently employed	−0.080	−2.131	.034*
Experience with repatriation	0.030	.799	.425
Total trauma exposure (17 items)	0.070	1.656	.098
PTSD symptom	0.142	3.203	.001**
DSO symptom	0.104	2.231	026*
Physical activity (tertile)	−0.036	−.993	.321
Loneliness	0.265	6.242	<.001**
Perceived discrimination (quintile)	0.145	3.347	.001**

Note: PTSD, post-traumatic stress disorder; DSO, disturbances in self-organization. $R^2 = 0.467$.
* $p < .05$, ** $p < .01$.

Probable PTSD and DSO accounted for more than 27% of explained variance in somatic symptoms, respectively, underscoring the close link between trauma-related psychopathology and somatic symptoms. This finding is consistent with recent international evidence showing elevated somatic symptom burden among individuals with PTSD and DSO in the international cohort of female mental health service users (Li et al., 2025), as well as greater somatic symptom severity and symptom counts among civilian war victims from Kosovo with PTSD compared to those without PTSD (Morina et al., 2018). Several mechanisms may underlie this association including chronic stress responses, heightened

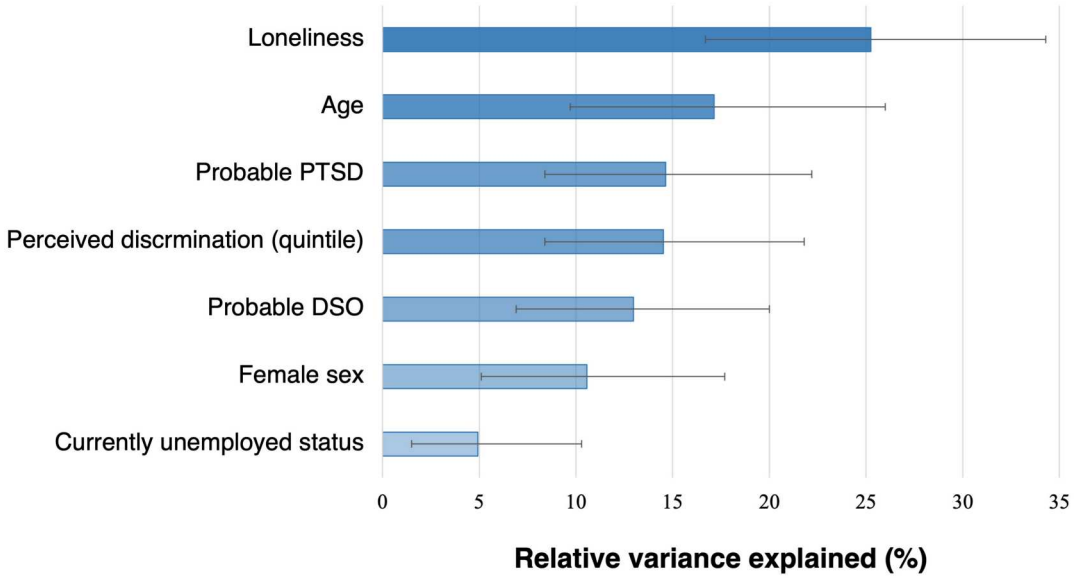

Figure 1. Results of relative importance analysis. Note. DSO, disturbances in self-organization; PTSD, post-traumatic stress disorder. Error bars represent 95% confidence intervals

physiological arousal, and hypervigilance, which can amplify relatively weak bodily sensations (Chu et al., 2025; Ford, 1997). Similarly, trauma exposure and PTSD have been associated with maladaptive cognitive perceptions and interpretations of bodily sensations, such as pain catastrophizing, heightened body vigilance, and fear of pain (Tsur et al., 2023), all of which may exacerbate the experience of somatic symptoms. Beyond physiological pathways, it is also possible that individuals experiencing PTSD and DSO symptoms express psychological distress through somatic complaints, using bodily symptoms as a communication strategy in contexts where emotional suffering is difficult to articulate (Choi et al., 2016; Ford, 1997). Taken together, these findings highlight the need for comprehensive clinical approaches that include routine screening for somatic symptoms in trauma-exposed populations and the integration of psychological and medical care to more effectively address the complex interplay between trauma-related and somatic symptoms.

Although not extensively addressed in this study, somatic symptoms of NKDs may be partially attributable to their mental health stigma. It has been reported that NKDs have a lower awareness of and more negative attitudes toward mental illnesses than the general South Korean population (Kim et al., 2018; Kim & Kim, 2016). These tendencies can be attributed to outdated perspectives toward mental illnesses and treatment in North Korea. In a qualitative study of the experiences of NKDs who worked as medical doctors in North Korea for more than 10 years, only patients with vivid psychotic symptoms were treated in the psychiatric department, whereas less attention was paid to non-psychotic symptoms (Kim et al., 2012). In addition, the lack of coverage of mental illness in media outlets in North Korea would have precluded open discussions on mental health, thereby leading to a lack of awareness and stigma surrounding mental illnesses in the North Korean general population (Kim et al., 2012). Due to these psychological and social-contextual factors, combined with heightened physiological responses from trauma exposure and chronic stress, NKDs are more likely to attribute psychological symptoms to physical causes. In fact, in a sample of 85 North Korean refugees who consulted psychiatric clinics, 55.3% reported insomnia and 43.5% reported headaches (Kang et al., 2012). Moreover, 95% of these patients had made outpatient visits to non-psychiatric departments, including orthopedics (52%), gastroenterology (40%), and neurology (32%) (Kang et al., 2012). Since mental health stigma and confusion regarding mental and physical symptoms can significantly hinder adequate treatment and recovery (Song et al., 2016), further research is required to understand the biological and psychosocial etiology of somatic symptoms among NKDs and to design an effective strategy to raise mental health awareness in this population.

This study has several limitations. First, this study is based on cross-sectional data, which precludes any causal interpretation. Further longitudinal studies are needed to establish the temporality among the assessed variables. Second, owing to subtle linguistic differences between the South and North Korean languages, NKDs may have misunderstood the questions. Third, participants' recall bias is possible because of post-traumatic amnesia or delayed recall, especially regarding traumatic experiences (Elliott, 1997; Parker et al., 2022). Fourth, while this study examined prevalence and correlates of somatic symptoms, it did not include somatic symptom disorder or

bodily distress disorder. Future studies may extend this work by examining these diagnostic categories to provide a more comprehensive understanding in this population.

In conclusion, this study provides an up-to-date estimate of somatic symptoms and their correlates among trauma-exposed NKDs. Our findings highlight the high severity of somatic symptoms among NKDs and suggest factors associated with these. Further research is needed to develop and test culturally appropriate interventions to address the loneliness and perceived discrimination of NKDs, especially among those with comorbid PTSD or DSO symptoms, to help mitigate their somatic symptoms.

Author contributions

CRediT: **Hun Kang:** Conceptualization, Formal analysis, Writing – original draft; **Hokon Kim:** Data curation, Investigation, Project administration; **Ocksim Kim:** Data curation, Investigation; **Sang Hui Chu:** Conceptualization, Funding acquisition, Supervision, Writing – review & editing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Ethics approval

This study analyzed secondary data previously collected under the approval of the Severance Hospital Institutional Review Board (IRB number 4-2021-0897). All participants in the original study provided informed consent. No new data were collected for the current analysis.

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Data availability statement

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

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