

## Original Article

## Translation and psychometric testing of the Thai version of cancer survivors' unmet needs measure among cancer survivors

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## ABSTRACT

**Objective:** To evaluate the psychometric properties of the Thai version of the Cancer Survivors' Unmet needs (CaSUN-TH) scale among Thai cancer survivors after completion of primary treatment.**Methods:** Standardized translation procedures developed the Cancer Survivors' Unmet Needs into a Thai version (CaSUN-TH). Face validity was evaluated by a group of experts, and a pilot test on 10 cancer patients was conducted to evaluate its readability. A total of 236 cancer survivors who were attending follow-up visits at a cancer hospital in Thailand completed the CaSUN-TH. The internal consistency of the instrument was examined using Cronbach's  $\alpha$ . The association of the CaSUN-TH and its subscales with physical symptoms, QoL, age, gender, and type of cancer were examined for criterion validity and known-group validity. Construct validity was evaluated using confirmatory factor analysis.**Results:** The CaSUN-TH showed good readability and high content validity for use as an instrument to assess unmet needs among Thai cancer survivors. Cronbach's  $\alpha$  for the entire scale was 0.95. Confirmatory factor analysis indicated that the five-factor structure of the CaSUN-TH was good fit to the data (CFI = 0.901, SRMR = 0.074, RMSEA = 0.076 [90% confidence interval, 0.066–0.085]). In terms of construct validity, CaSUN-TH scores significantly correlated to other variables hypothesized to influence the level of need, including higher physical symptoms prevalence was related to poor quality of life, and poorer QOL and younger age were associated with a higher level of unmet needs. In addition, the scale was able to differentiate scores between groups, including gender, age, and type of primary cancer, with theoretically hypothesized differences.**Conclusions:** The CaSUN-TH demonstrated appropriate psychometric properties for assessing unmet needs in different cancer survivor groups in Thailand. Using the CaSUN-TH can help health professionals in targeting individual survivor needs, bridging the gap between patients' experiences and their expectations, and improving the quality of cancer survivorship care.

## Introduction

Cancer is becoming more prevalent worldwide, with particularly alarming increased prevalence in Asia, where nearly half of all new cases were discovered in 2020;<sup>1</sup> however, advances in medical technology for cancer diagnosis and treatment have resulted in greater numbers of cancer survivors.<sup>2</sup> Although many cancer survivors who complete their treatment attain complete recovery from cancer disease, they require ongoing support from health care providers;

however, cancer survivors commonly reported having unmet supportive care needs from their health care providers.<sup>3–5</sup> This is worse for those living in low-middle income countries (LMICs) as opposed to those in high-income countries (HICs).<sup>5</sup> The term “unmet needs” generally refers to cancer survivors' needs for supportive care from essential health services that have not been received from health care providers and/or the health care system. This term signifies deficiencies in all aspects of patients' lives that arise as a result of being diagnosed with cancer or another chronic illness. These requirements

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can emerge at any point along the disease trajectory, from diagnosis to treatment completion or death.<sup>6</sup>

A study in Thailand reported that cancer survivors have a high number of unmet needs;<sup>7</sup> moreover, the literature reports that a high number of unmet supportive care needs was related to poor quality of life (QoL).<sup>8</sup> Unmet needs assessment is crucial as it enables health care professionals to target survivors' individual needs, leading to optimal cancer survivorship care provision, as well as person-centered, tailored care; nevertheless, previous studies in Thailand focused on needs assessment during the detection period,<sup>9</sup> treatment period,<sup>10</sup> or advanced state of disease,<sup>11</sup> while knowledge about supportive care unmet needs in Thai cancer survivors is very limited. To date, there is a lack of appropriate instruments to evaluate supportive care unmet needs in each aspect of survivorship care for cancer survivors during the post-treatment period in Thailand.

Currently, many instruments have been developed and used to measure the unmet supportive care needs of cancer survivors, including Cancer Survivors' Unmet Needs (CaSUN),<sup>12</sup> Survivors Unmet Needs Survey (SUNS),<sup>13</sup> Short-Form Survivors Unmet Needs Survey Short-Form (SF-SUNS),<sup>14</sup> and Supportive Care Needs Survey;<sup>15</sup> however, most of the needs assessment instruments used in cancer patient studies cannot capture the survivorship period;<sup>16</sup> moreover, the needs assessment tools for post-treatment cancer survivors were analyzed by the Australian Cancer Survivorship Centre,<sup>17</sup> and the results showed that CaSUN has 35 items to assess unmet needs, which is a relatively small number of items compared to other instruments.

CaSUN, however, does cover all aspects of survivorship care within five domains (existential survivorship, comprehensive care, information, quality of life, and relationship) with good reliability and validity. Therefore, the CaSUN instrument is appropriate for use in assessing unmet needs among cancer survivor groups because it is inherently germane for this purpose, being practical (quick to fill in) and relatively comprehensive in capturing all unmet needs during the post-treatment period. CaSUN has been translated into many languages such as Chinese,<sup>18</sup> Japanese,<sup>19</sup> and Spanish<sup>20</sup> etc. The literature supports that the CaSUN instrument can be used in various contexts,<sup>21</sup> languages, and cultures with good reliability, and it was assumed to be potentially suitable to use as a tool for the assessment of unmet needs among Thai cancer survivors; however, translation and validation of this instrument among Thai cancer survivors have not yet been done to determine its quality and utility in the Thai context.

Therefore, this study translates the CaSUN into a Thai version (CaSUN-TH) and tests its psychometric properties among Thai cancer survivors. The CaSUN-TH was tested by reliability testing and construct validity using confirmatory factor analysis (CFA). In addition, the associations between physical symptoms, QoL, demographic, clinical characteristics, and unmet needs were tested to confirm the construct validity of the CaSUN scales when used in a Thai context.

## Methods

### Design

This psychometric testing study was conducted as a secondary analysis of the Thai data set, which was part of a larger multinational study assessing unmet needs among cancer survivors in nine high- and low-income countries in Asia (in the STEP study).<sup>5</sup> The study comprised two phases. In Phase I the forward-backward translation method was used to translate the CaSUN from English into Thai based on standard procedures, and then its content validity was tested. In Phase II, the psychometric properties of the resultant CaSUN-TH were assessed, including internal consistency and construct validity.

### Phase I: translation and content validity

The translation of CaSUN followed the World Health Organization (WHO) guidelines on the process of translation and adaptation of instruments.<sup>22</sup> First, the original version of the 35-item CaSUN was translated from English into Thai by two independent nurse educators who are fluent in both languages, and both translations were examined by a third translator and were discussed with the principal investigator. Subsequently, back-translation from Thai into English was undertaken by another bilingual professional translator with no prior knowledge of the CaSUN instrument. The back-translated version was compared by the second author (KP) with the original version. Issues regarding ambiguities and discrepancies of words, sentences, and meaning equivalences between the two versions of CaSUN were identified, discussed, and resolved using a group discussion or committee approach.<sup>23</sup>

In terms of the content validity of the CaSUN, an expert panel of 10 oncology practitioners (two physicians, five oncology nurses, one oncology counseling nurse, one pharmacist, and one social worker) was invited to evaluate the instrument at the scale level and item level. These experts were also requested to give opinions and suggestions for each item. An assessment sheet of open-ended questions was designed to evaluate the CaSUN in terms of relevance, comprehensiveness, and acceptability.<sup>12</sup> In addition, the researchers conducted a pilot test with a convenience sample of 10 cancer survivors to evaluate the readability and clarity of the CaSUN-TH on their perspective. Each cancer survivor was asked if any item was vague or unclear, and if they had identified any items as such, they would have been further interviewed to get more information and suggestions on how to rewrite the statement more clearly based on their recommendations.<sup>24</sup>

### Phase II: psychometric testing of CaSUN-TH

#### Participants and research setting

By using the convenience sampling method, potential participants were recruited from adult cancer survivors who came for a follow-up visit at the outpatient department of a cancer hospital located in the central region of Thailand. This study included eligible participants who were at least 18 years old; had already completed primary treatment (the first treatment given for a disease, which is often part of a standard set of treatments, such as surgery followed by chemotherapy and radiation; when used by itself, primary treatment is the one accepted as the best treatment)<sup>25</sup>; had a current disease-free status (in cancer, the length of time after primary treatment ends for a cancer that the patient survives without any signs or symptoms of that cancer)<sup>26</sup>; were able to speak, read, and write in Thai; and were not cognitively impaired. According to the minimum sample size of CFA, the minimum sample size recommendation is at least five participants per item.<sup>27</sup> Thus, the sample size of 236 participants was suitable for a psychometric evaluation of CaSUN using CFA.

#### Measurements

The following self-administered questionnaires from the parent study were used in the study:

**Demographic Questionnaires:** Questions were asked to elicit basic demographic and clinical data, including age, gender, length of survival (years), treatment, and number of treatments.

**Physical symptom concerns:** The physical effect subscale of the Cancer Survivor Survey of Needs<sup>28</sup> consists of 19 physical symptoms experienced by cancer survivors on a numerical rating scale (6 levels; 0 = no concern to 5 = extreme concern). In this study, Cronbach's  $\alpha$  coefficient was 0.80.

**Perception of Quality of Life:** A single item on the global QoL scale<sup>29</sup> was used to assess overall QoL perception in the previous week. This instrument used a 10-point numeric rating scale (range: 0 = worst QoL to

10 = best QoL). This instrument is accepted for validity and reliability in assessing overall QoL, and this instrument is effective in assessing patients' QoL.<sup>29</sup>

**Cancer Survivors' Unmet Needs-Thai (CaSUN-TH):** The 35-item CaSUN-TH was used to assess the unmet supportive care needs of cancer survivors. For each item, the cancer survivors replied whether needs were unmet using a five-level numerical rating scale (0 = no need or not applicable; 1 = have a need, but the need is being met; 2 = weak unmet needs; 3 = moderate unmet needs; and 4 = strong unmet needs).

Based on the original version,<sup>12</sup> CaSUN is divided into five domains: existential survivorship or psychosocial care (14 items), comprehensive cancer care (6 items), information (3 items), quality of life (2 items), and relationships (3 items). The remaining seven items are not grouped into a domain but are retained for being used to measure useful clinical information. In the current study, a total of 28 unmet needs items from the five domains were included in the validation analysis of the CaSUN-TH's psychometric properties. This instrument demonstrated good validity and reliability, with a Cronbach's  $\alpha$  coefficient of 0.96.<sup>12</sup> In this study, the Cronbach's  $\alpha$  coefficient was 0.95.

*Ethical considerations*

Approval for this research was obtained from the Institutional Review Board of the Faculty of Nursing, Mahidol University (Approval No. IRB-NS2021/18.0305). The participants were fully informed about the research purpose and their right to refuse participation and to withdraw at any time during the study, and that their health care services would not be affected. Written informed consent was obtained from each participant before starting data collection.

*Data collection*

Eligible cancer survivors were approached by nurses while waiting to attend physician appointments at an outpatient clinic. After participants completed all questionnaires, the document was immediately checked for completeness by the researchers.

*Data analysis*

RStudio software<sup>30</sup> was used to analyze the data. Descriptive statistics such as frequency, percentage, mean and standard deviation (SD) were used to summarize participants' demographic, disease-related characteristics, and the outcome measures of the total needs listed in the CaSUN-TH. The reliability of the CaSUN-TH was assessed by testing its internal consistency, measured using Cronbach's  $\alpha$  coefficient for the total scale and its subscales, whereby a value of Cronbach's  $\alpha > 0.70$  was considered to indicate satisfactory internal consistency.<sup>31</sup>

The construct validity of the CaSUN-TH was assessed by CFA using the Lavaan package<sup>32</sup> in RStudio, to examine the configuration of the five-factor structures. The parameters of the CFA model were estimated by the robust maximum likelihood method (MLR),<sup>33</sup> which allowed the violation of the multivariate normality assumption of the data. Several goodness-of-fit indices were used to assess the adequate model fit, including the Satorra-Bentler scaled  $\chi^2$  statistic to degree of freedom ratio ( $\chi^2/df < 3.0$ ), standardized root-mean-square residual (SRMR)  $< 0.08$ ,<sup>34,35</sup> root-mean-square error of approximation (RMSEA)  $\leq 0.08$ , and comparative fit indices (CFI) values  $> 0.90$ .<sup>35,36</sup>

For comparing with the original study, this study applied physical symptoms, QoL, and age to evaluate the CaSUN-TH criterion validity in terms of predictive and concurrent validity. The associations of the CaSUN-TH and its subscales with physical symptoms, QoL, and age were investigated by Spearman's correlation coefficients.<sup>37</sup> Values of the correlation coefficient ( $r$ )  $< 0.25$ ,  $0.25-0.50$ ,  $0.50-0.75$ , and  $> 0.75$  indicate little, fair, moderate to good, and excellent relationships, respectively.<sup>38</sup>

In addition, the CaSUN-TH discrimination between the unmet needs reported by different sociodemographic and clinical data subgroups was compared using unpaired two-samples Wilcoxon test and Kruskal-Wallis Rank-Sum test, with Dunn's Test of Multiple Comparisons due to non-normal distribution.

**Results**

*Phase I: translation and content validity*

Generally, the researchers clarified any discrepancies in each item between the translated Thai version, the back-translated English version, and the original version of CaSUN. All items were checked, and no discrepancies were found; thus, there were no additional amendments to add any items.

Evidence for content validity of the CaSUN-TH provided by the expert panel from responses on the evaluation sheet supported its relevance, comprehensiveness, and acceptability. The CaSUN received full agreement (100%) from all experts concerning relevance at the scale and item levels, and their overall subjective feedback from the instrument evaluation confirmed that the CaSUN-TH was comprehensive, acceptable, and highly related to the topic of unmet supportive care needs among cancer survivors.

Based on the overall subjective feedback provided by a sample of 10 Thai cancer survivors, the CaSUN questionnaire was found to be good in terms of reading ease and clarity: all pilot test participants considered the items clear and easy to understand. The CaSUN-TH indicated good readability for use as an assessment tool in various groups of Thai cancer survivors.

Consequently, no changes were made to any individual items, and none of them were excluded from the CaSUN-TH version. Finally, the researchers reviewed and made minor changes in some items for language appropriateness, as suggested by the expert panel and cancer survivors, before using the CaSUN-TH in the Thai context.<sup>5,7</sup> The average time to complete the questionnaire was approximately 10-15 min.

**Table 1**

Demographic, disease-related characteristics of the participants, and study variables.

Variables	n	%
Age (years)		
30-45	33	13.98
46-60	125	52.97
61-75	63	26.69
Older than 75	15	6.36
Gender		
Male	63	26.69
Female	173	73.31
Length of survival (years)		
<1	43	18.22
1-5	153	64.83
>5	40	16.95
Type of primary cancer		
Breast	90	38.14
Colorectal	50	21.19
Lung	20	8.47
Gynecological	50	21.19
Head and neck	26	11.02
Variables	$\bar{x}$	SD
Age	57.08	10.31
Length of survival (years)	3.41	2.50
Quality of life	8.53	1.65
Physical symptoms	0.61	0.55
CaSUN-TH	22.45	26.70
Existential survivorship	7.42	11.04
Comprehensive cancer care	7.09	7.11
Information	2.88	4.05
Quality of life	1.32	2.40
Relationships	0.51	1.66

Phase II: psychometric properties

Participant characteristics

In total, 236 cancer survivors participated and submitted completed questionnaires in the study. Demographic and disease-related characteristics of the participants as well as other study variables are shown in Table 1. The mean age of the participants was 57.08 (SD = 10.31). The majority of participants were female (73.31%). The mean length of survival of all cancer survivors was 3.41 years (SD = 2.50). Most participants were diagnosed with breast cancer (38.14%). The mean total score of the CaSUN-TH was 22.45 (SD = 26.70), with the following

subscale scores: existential survivorships [ES] (mean = 7.42, SD = 11.04); comprehensive cancer care [CCC] (mean = 7.09; SD = 7.11); information [Inf] (mean = 2.88; SD = 4.05); quality of life [QL] (mean = 1.32; SD = 2.40); and relationships [Rel] (mean = 0.51; SD = 1.66). The mean scores for the physical symptoms and the QoL were 0.65 (SD = 0.51) and 8.53 (SD = 1.65), respectively.

Internal consistency

The Cronbach's  $\alpha$  coefficient for the total CaSUN-TH was 0.95. The Cronbach's  $\alpha$  coefficient values for its subscales were 0.92 for existential survivorship, 0.82 for comprehensive cancer care, 0.88 for

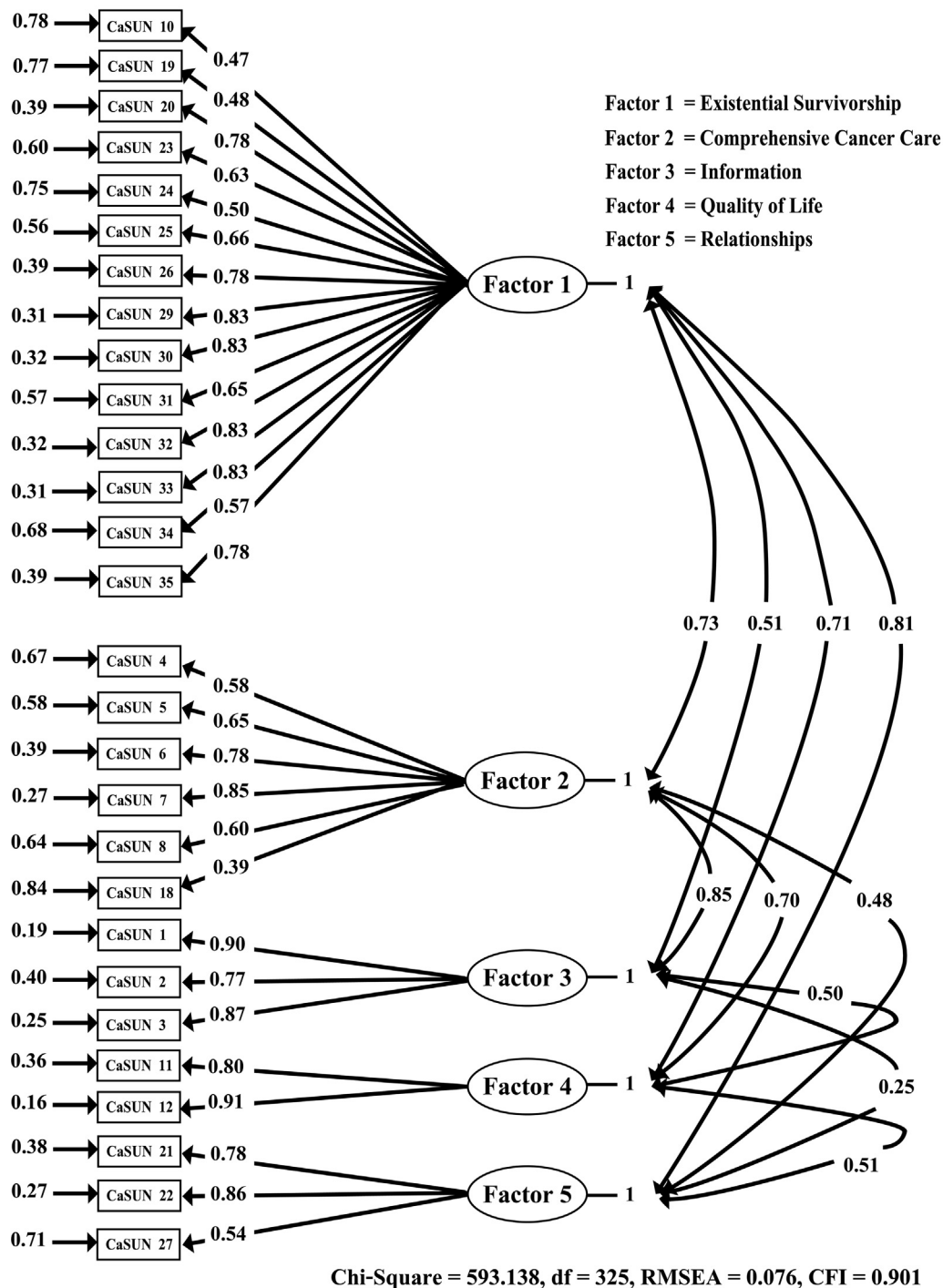


Fig. 1. Confirmatory factor analysis of CaSUN-TH.

information, 0.84 for quality of life, and 0.75 for relationship. All Cronbach's  $\alpha$  coefficients were above the minimum acceptable criterion of  $\geq 0.7$ .

**Construct validity**

CFA was applied to the five-factor model with 28 items (Fig. 1), revealing good model fit. Standardized factor loadings ranged from 0.39 to 0.91, and error variances from 0.16 to 0.84. On the whole, the model indicated a good fit with the data:  $\chi^2/df = 1.83$ , CFI = 0.901, SRMR = 0.074, RMSEA = 0.076 (90% confidence interval, 0.066–0.085).

Factor 1 reflected themes around “existential survivorship,” including 14 items related to reducing stress and adjusting cancer survivors’ lives (including health, life, and spiritual management).

Factor 2 was named “comprehensive cancer care” and consisted of six items related to the best medical care, patient participation, and health care services from the hospital.

Factor 3 comprised three items pertaining to information related to unmet needs for updated information.

Factor 4 reflected issues around “quality of life” and included two items pertaining to supportive care needs when dealing with changes in QoL and managing medication/treatment side effects.

Factor 5, labeled “relationship,” consisted of three items pertaining to the impact of cancer on patient relationships with partners, family, friends, and others.

**Criterion validity of the CaSUN-TH**

The Spearman correlations between CaSUN-TH total scores, CaSUN-TH subscale scores, physical symptoms, quality of life, and age are displayed in Fig. 2. Unmet needs and their subscale scores were significantly positively correlated. Higher physical symptoms scores were significantly associated with higher levels of unmet needs and subscale scores, except

for the information subscale. On the contrary, higher physical symptoms scores were significantly correlated with poorer QoL, while lower QoL scores were significantly associated with higher levels of unmet needs and its subscale scores, except for comprehensive cancer care and relationships subscales. Lower patient age was significantly associated with higher levels of unmet needs. These findings provide evidence that the CaSUN-TH has good criterion validity in cancer survivors.

**Known-group validity of the CaSUN-TH**

Known-group analyses were conducted to test the hypotheses that age, gender, length of survival, and type of primary cancer affect the level of unmet needs among cancer survivors. The discrimination of CaSUN-TH between the unmet needs and its subscales reported by different subgroups of sociodemographic and clinical variables is presented in Table 2. The total unmet needs of female cancer survivors (mean = 23.3, SD = 26.0) were significantly higher than those of male cancer survivors (mean = 20.3, SD = 28.7). In addition, all subscales were significantly different between gender, except the relationship subscale. Total unmet needs and their subscales were not significantly different among different age groups, except for the existential survivorship subscale, which was significantly higher among the 30 to 45-year-old survivor age cohort than among the 61 to 75-year-old survivors (Fig. 3 [a]).

The total unmet needs and its subscales were not significantly different between different lengths of survival, while they were significantly different between each type of cancer. The total unmet needs, comprehensive cancer care subscale, and quality of life subscale of breast cancer survivors were significantly different from colorectal cancer survivors. The latter were significantly different from gynecological and head and neck cancer survivors. The total information subscale of colorectal cancer survivors was only significantly different from gynecological cancer survivors. Furthermore, the total relationships subscale of

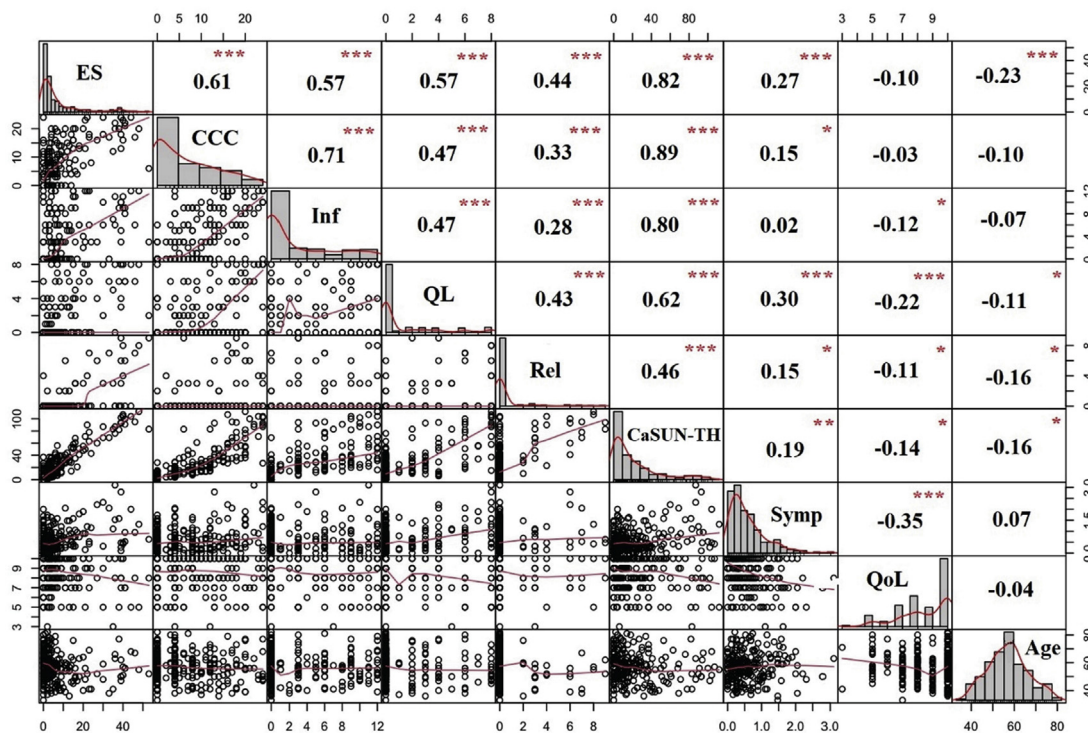


Fig. 2. Correlations between scores on the CaSUN-TH and its subscale with physical symptoms, QoL, and age. \*, \*\*, \*\*\* Correlation is significant at the 0.05 level (2-tailed), the 0.01 level (2-tailed), the 0.001 level (2-tailed), respectively. ES, Existential Survivorship; CCC, Comprehensive Cancer Care; Inf, Information; QL, Quality of Life; Rel, Relationship; CaSUN-TH, Thai version of cancer survivors’ unmet need scale; Symp, Physical symptoms; QoL, Quality of Life..

**Table 2**  
Comparison between unmet needs, sociodemographic, and clinical variables.

Unmet needs	Sociodemographic				Clinical variables			
	Gender		Age		Length of survival (years)		Type of primary cancer	
	$\chi^2$	P-value	$\chi^2$	P-value	$\chi^2$	P-value	$\chi^2$	P-value
Existential survivorship	40,594.5	0.0000***	10.898	0.0123*	5.241	0.0728	25.515	0.0000***
Comprehensive cancer care	39,745.0	0.0000***	2.945	0.4002	2.296	0.3173	24.976	0.0001***
Information	27,333.5	0.7101	1.598	0.6599	1.476	0.4782	11.147	0.0250*
Quality of life	21,198.5	0.0000***	3.202	0.3615	2.733	0.2549	20.354	0.0004***
Relationships	12,546.5	0.0000***	6.280	0.0988	0.915	0.5328	18.509	0.0010**
CaSUN-TH	46,289.0	0.0000***	6.482	0.0904	2.823	0.2438	28.859	0.0000***

Signif. codes: \*  $P < 0.05$ , \*\*  $P < 0.01$ , \*\*\*  $P < 0.001$ .

head and neck cancer survivors was significantly different from others as shown in Fig. 3 (b).

## Discussion

This study has translated CaSUN into Thai using a rigorous procedure recommended by WHO,<sup>23</sup> comprising forward-backward translation and expert panel content validation, one of the standard procedures of instrument translation. Translation and psychometric testing clarified and confirmed that the CaSUN-TH is a reliable and valid instrument. This is consistent with previous studies, which translated the CaSUN instrument into other languages using the WHO translation method, which found that translated versions also had good reliability and validity.<sup>20,21</sup> The CaSUN-TH was tested for its psychometric properties, and the results of analysis by Cronbach's  $\alpha$  and CFA demonstrated that it had desirable reliability and validity. The results show that CaSUN-TH is a valid and reliable tool in assessing unmet needs suitable for the construct, related population, and socio-cultural background of Thai culture and context.

As for reliability, the CaSUN-TH has a Cronbach's  $\alpha$  coefficient of 0.95 overall, with dimensional scores ranging from 0.75 to 0.92. The high internal consistency of the CaSUN-TH obtained in this study was supported by the fact that Cronbach's  $\alpha$  coefficients are greater than 0.70, indicating good reliability.<sup>39</sup> The results were consistent with the original version by Hodgkinson et al,<sup>12</sup> and other CaSUN versions in various national cultural contexts, including versions for Spanish,<sup>22</sup> Dutch,<sup>40</sup> Japanese,<sup>21</sup> and Chinese (PRC<sup>20,37</sup> and Taiwan<sup>41</sup>) settings. The high internal consistency of CaSUN in different language contexts, including CaSUN-TH, constitutes evidence of its strong reliability.

The results of the CFA model of Thai cancer survivors with CFI = 0.904 and RMSEA = 0.078 indicated that the original instrument's structure, including five dimensions, is suitable for the Thai culture and context, based on the CFA model fit findings, with CFI > 0.90 and RMSEA  $\leq$  0.08.<sup>35,36</sup> The CFA model supports that the original five-dimensional structure of CaSUN has a reasonably good fit with Thai cancer survivors. However, item 18 of CaSUN-TH, which is related to accessible hospital parking, had the lowest factor loading (0.39) and largest residual error (0.84). One possible explanation is that item 18 had a low correlation with other items in the comprehensive cancer care dimension. This finding was similar to the result of the Chinese<sup>20</sup> and Japanese<sup>21</sup> versions of CaSUN; however, the reason might be different and particular because more than one-third of Thai cancer survivors who participated in the study reported moderate to strong unmet needs<sup>7</sup> related to this point, similar to another study in Thailand,<sup>8</sup> which reported a high level of unmet needs with hospital parking (ie, hospital parking is a particularly egregious issue in Thailand). Furthermore, Thailand has relatively inadequate regional transportation in some provinces, and thus, many cancer survivors prefer to use private transport to access care facilities, but they cannot do so because of institutional parking limitations. Hence, hospital parking is an important issue and should be reconsidered to solve the problems for cancer patients seeking health services at the hospital in the future.

Construct validity analysis affirms that higher physical symptoms, poorer QoL, and younger age scores were associated with higher levels of unmet needs. In particular, the QoL dimension of CaSUN-TH had a highly negative association with overall QoL, but this dimension had a highly positive association with physical symptoms. These findings were similar to the results of previous studies in other languages of CaSUN, supporting that a high level of unmet needs related to high number of physical symptoms, particularly in Asian populations,<sup>5,8,21,42,43</sup> and reduced QoL.<sup>7,8,21,42</sup> Furthermore, younger age cancer survivors reported higher unmet needs because they have additional needs for psychosocial support and residual symptoms etc. More than half of young adult cancer survivors reported unmet needs related to cancer coming back, treatment and management, and support from health care professionals.<sup>44</sup>

Furthermore, young cancer survivors have fewer individual experiences compared with older cancer survivors, and therefore the adaptation process of this group might be more difficult than for the older group. Previous research reported that individual backgrounds and present symptoms play a more important role in unmet needs than age *per se*,<sup>45</sup> while younger cancer survivors consistently report higher unmet needs than other age group.<sup>46</sup> Furthermore, female cancer survivors reported higher unmet needs scores than their male counterparts, possibly because female cancer survivors had more points of concern such as issues relating to body image and residual symptoms (which, in turn, are associated with breast cancer, as discussed below, which generally affects women), and personal relationships, etc.

Additionally, different types of cancer were related to significantly different levels of unmet needs (e.g., between breast and colorectal cancer). This finding might be related to the residual symptoms of breast cancer survivors, who experience higher physical symptoms (numbness in hand/feet, sleep disturbance, fatigue, and pain) compared to survivors of other types of cancer.<sup>7</sup> The results, however, showed that length of survival was not related to unmet needs, possibly because cancer survivors who completed treatment still needed support from health care providers. It was supported by the results from a previous study that the priority of needs among cancer survivors change throughout the treatment journey, even among cancer survivors of over 10 years,<sup>8</sup> however, the most common unmet needs among cancer survivors related to concerns about cancer recurrence.<sup>7</sup> Thus, interventions for cancer survivors should be initiated based on the particular needs of each cancer type and each time point. The literature supports that the unmet needs of cancer survivors can be determined and matched with resources to improve patients' QoL.<sup>47</sup> Therefore, these findings of significant correlations between unmet needs with physical symptoms and QoL showed full support for the construct validity of CaSUN-TH as a standard instrument to measure unmet needs in Thai cancer survivors.

## Strengths and limitations

First, this was a cross-sectional study using data from a larger parent study; consequently, test-retest and criterion validity were not examined.

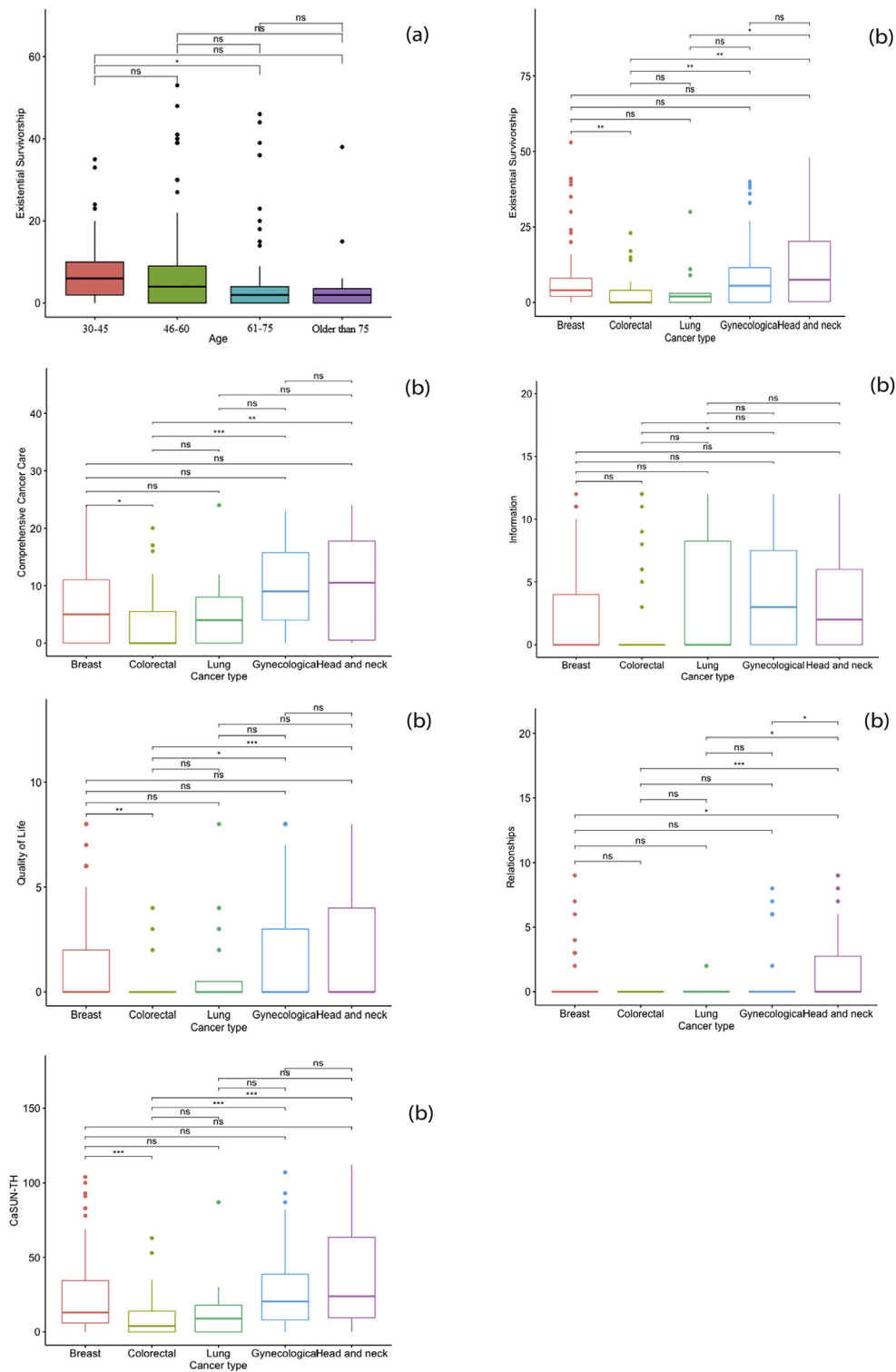


Fig. 3. Post hoc test between (a) unmet needs and age group, (b) unmet needs and type of primary cancer. Signif. Codes: \*  $P < 0.05$ , \*\*  $P < 0.01$ , \*\*\*  $P < 0.001$ , ns: nonsignificant.

Although the results of CFA supported the original model, the reader should also be aware that some items had low factor loadings. Next, more than two-thirds of participants were female; consequently, this gender imbalance should be considered when applying these results to specific groups of oncology populations, especially cancers that primarily affect males (such as prostate cancer). Nevertheless, this study drew on data from many types of cancer and demonstrated that the CaSUN-TH can fit

with the Thai culture and context and is suitable for use to measure unmet needs among Thai cancer survivors.

### Conclusions

This study confirmed that CaSUN-TH is a valid and reliable instrument to measure unmet needs among Thai cancer survivors, and it can

serve as a potential tool to evaluate the unmet needs of cancer survivor intervention as a standard instrument.

Health care providers in Thailand are advised to use the CaSUN-TH instrument to assess unmet needs among cancer survivors and to address the gap in needs among these service users. The CaSUN-TH can be used to gain insight into the information and support needs of cancer survivors. Therefore, experimental research related to interventions for cancer survivors should target the exploration of cancer survivors' unmet needs in order to improve their health and quality of life.

#### Author's contributions

Conceived and designed the analysis: Pichitra Lekdamrongkul, Kanaungnit Pongthavornkamol, Alex Molassiotis, Pornpip Dechpichai, Pimchan Pinsuntorn. Collected the data: Pimchan Pinsuntorn. Contributed data or analysis tools: Pichitra Lekdamrongkul and Kanaungnit Pongthavornkamol. Performed the analysis: Pornpip Dechpichai. Wrote the manuscript: Pichitra Lekdamrongkul, Kanaungnit Pongthavornkamol, Alex Molassiotis, Pornpip Dechpichai. Approved the manuscript: Pichitra Lekdamrongkul, Kanaungnit Pongthavornkamol, Alex Molassiotis, Pornpip Dechpichai, Pimchan Pinsuntorn.

#### Declaration of competing interest

None declared.

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#### Ethics statement

This study was approved by the Institutional Review Board of the Faculty of Nursing, Mahidol University, Thailand (Approval No. IRB-NS2021/18.0305).

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#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.apjon.2022.100083>.

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