RESEARCH ARTICLE

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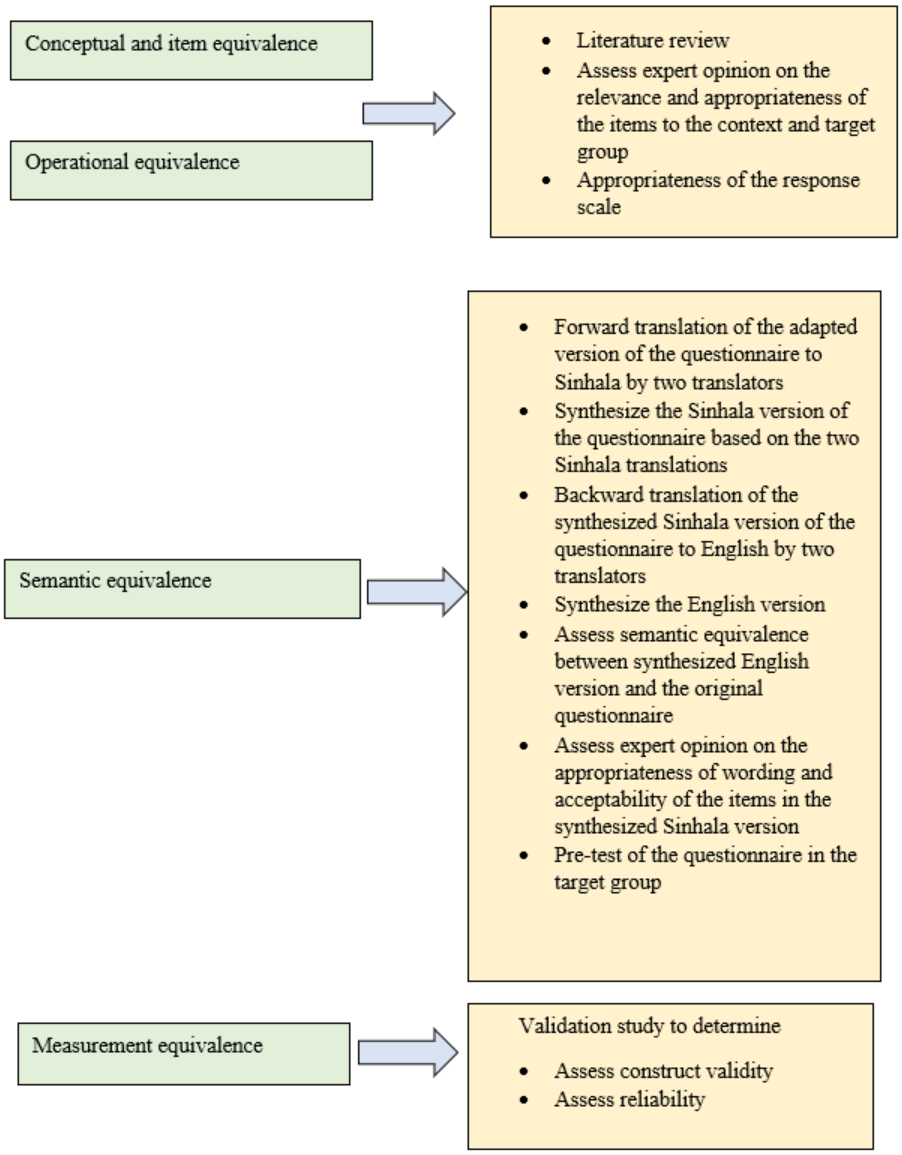
D.R.D.L. Ratnayake*, R.S.A. Usoof and L. Ekanayake



Framework related to cross-cultural adaptation process of the questionnaire to assess SOC

Highlights

- Salutogenesis has been identified as an effective approach to health promotion and, Sense of Coherence (SOC) is the central construct of the health model of Salutogenesis.
- Antonovsky's SOC-13 item questionnaire has been developed to measure the construct "Sense of Coherence" in English-speaking populations.
- Antonovsky's SOC-13 item questionnaire was tested for its validity and reliability in Sinhala-speaking adolescents in Sri Lanka using data obtained from 400, 15-year-old students from Kandy district, Sri Lanka.
- The Sinhala version of the Adolescence Sense of Coherence questionnaire produced a single-factor solution with 5 items that accounted for 40.8% of the total variance of the scale.
- The reliability of the questionnaire was assessed through internal consistency and test-retest reliability and was moderate.

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Cross-cultural adaptation and validation of a Sinhalese version of the Sense of Coherence 13-item scale among adolescents in Sri Lanka

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Abstract: Sense of Coherence (SOC) is the central construct of the health model of Salutogenesis, which has been identified as an effective approach for health promotion in adolescence as it focuses on pathways and mechanisms leading to health rather than disease and addresses the "upstream" social determinants of health. Antonovsky developed the SOC-13 item questionnaire to assess sense of coherence with the three dimensions, comprehensibility, manageability and meaningfulness in English-speaking populations. This study was conducted to assess the validity and reliability of Antonovsky's SOC-13 item questionnaire for use among Sinhala-speaking adolescents in Sri Lanka. The cultural adaptation process included the establishment of item, conceptual, operational, and semantic equivalence of the questionnaire. Principal component analysis (PCA) and confirmatory factor analysis (CFA) were used to determine construct validity. Data from a sample of 400, Sinhala speaking 15-year-old students attending Sinhala medium government schools in Kandy district were used for this purpose. The reliability was assessed using internal consistency and test-retest reliability. The culturally adapted 'Sinhala version of the Adolescence Sense of Coherence questionnaire produced a single-factor solution with 5- items that accounted for 40.8% of the total variance of the scale. These 5 items included at least one item from the three different dimensions of the original questionnaire namely comprehensibility, manageability, and meaningfulness. The model fitted adequately with a single factor solution (c^2 = 5.65; p=0.32, CFI=0.99, RMSEA=0.026) when assessed with CFA. The reliability of the questionnaire assessed through internal consistency (Cronbach alpha=0.63) and test-retest reliability (Spearman r correlation coefficient=0.65) were moderate. The Sinhala version of the adolescents' sense of coherence questionnaire is a valid and reliable instrument to measure the construct sense of coherence in 15-year-old Sinhala-speaking students in Sri Lanka.

Keywords: Sense of coherence; Salutogenesis; Validity; Reliability

INTRODUCTION

The health model of salutogenesis which is a health promotion model was introduced by Dr. Aaron Antonovsky, a medical sociologist in 1979 (Antonovsky, 1987) . Unlike the traditional bio-medical models of health which deal with disease, Antonovsky proposed a salutogenic orientation towards health that focuses on factors leading to health rather than disease. According to Antonovsky (1987), the human environment causes continuous stressors which could be genetic, microbiological, personal, economic, socio-cultural or geopolitical. Further, he stated that despite these stressors, an individual possesses internal and external resources which could be used effectively to promote one's health. He termed these external and internal resources as generalized resistance resources (GRR). These resources assist an individual to cope with life stressors effectively and successfully manage tension throughout life and stay healthy (Antonovsky, 1987). Examples of these resources include living conditions in childhood, social support, cultural cohesion, education, culture, religion, income, coping strategies and preventive health orientation (Mittelmark et al., 2022). The ability to effectively use these GRR for the betterment of one's health is termed "sense of coherence" (SOC). Individuals with a high SOC assess intrinsic and extrinsic stimuli as non-stressful (comprehensibility), perceive resources to be readily available to cope with stress (manageability) and view life events and ill health as challenges that are worthy of effort and investment (meaningfulness) (Antonovsky, 1987). Therefore, the health model of salutogenesis and its central construct, sense of coherence has been identified as an effective approach to health promotion.

The health model of salutogenesis and its construct SOC have been used to promote health among adolescents. According to Antonovsky, the basic level of SOC develops during early childhood and attains a threshold during the third decade of life. The baseline level of SOC attained in childhood will either be strengthened or weakened by life experiences encountered during adolescence (Antonovsky, 1987).

In 1987, Antonovsky developed a questionnaire to measure the theoretical construct of SOC and named it the "orientation to life questionnaire", which is referred to as the SOC questionnaire in the literature. Whilst the original questionnaire consisted of 29 items (SOC-29), he later developed a 13-item version (SOC-13) as it was more convenient to be used in large community surveys. The SOC scale has been translated into at least 51 different languages and adapted to be used among diverse populations (Mittelmark et al., 2022). The SOC-13, scale has been used frequently among adolescents due to

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its better clarity compared to the original 29-item scale (Mittelmark et al., 2022). However, only a few researchers have validated it among non-English-speaking adolescent (Moksnes & Haugan, 2014).

The present study was conducted as part of a larger study that focused on the application of the health model of salutogenesis and its' construct SOC to promote oral health among adolescents. Therefore, to assess sense of coherence, the construct "sense of coherence" should be operationalized in the Sri Lankan setting first. Hence this study aimed to assess the validity and reliability of the SOC-13 item scale to be used among Sinhala-speaking adolescents in Sri Lanka. Further, it is the first attempt to cross-culturally validate the construct of sense of coherence among a Sinhala-speaking population in Sri Lanka.

MATERIALS AND METHODS

The Ethics Review Committee, Faculty of Dental Sciences, University Peradeniya (ERC/FDS/UOP/E/2021/01) granted ethical clearance to conduct the study. Permission was also obtained from the Provincial Director of Education of the Central province and relevant principals of schools. The original English version of the SOC -13 questionnaire was retrieved and permission was obtained from the current copyright owner Dr. Avishai Antonovsky and the Society for Theory And Research on Salutogenesis (STARS) to translate and adapt it for use in Sri Lanka.

The original English version of the SOC-13 questionnaire consists of 13- items in three domains: comprehensibility, manageability and meaningfulness. The response scale for each item ranges from 1 to 7 and consists of both positively and negatively worded items. The total score therefore ranges from 13 to 91. A higher score indicates a higher level of SOC. The cross-cultural validation process was based on a model of equivalence (Gjersing et al., 2010; Herdman et al., 1998; Reichenheim & Moraes, 2007).

Conceptual, item and operational equivalence: Conceptual equivalence assesses whether the construct and domains in the source instrument are equally relevant and appropriate to the concept in the target culture (Herdman et al., 1998; Reichenheim & Moraes, 2007). Item equivalence exists when items estimate the same parameters on the latent variable being measured and when they are equally relevant and acceptable to both cultures (Herdman et al., 1998; Reichenheim & Moraes, 2007). Therefore, to establish conceptual and item equivalence, the original English version of the SOC-13 scale was assessed by a 7-member expert panel from the fields of social psychology, sociology, clinical psychology, psychiatry, and public health for its relevance and appropriateness to be used among Sri Lankan adolescents.

They were requested to rate the relevance of each item of the SOC-13 to the local context and the target population on a 4-point scale; Score 1; not relevant to the local context or adolescents and Score 4; highly relevant. An item was considered appropriate for retention in the questionnaire if 6 of the 7 experts gave a score of 3 or 4 (Polit et al., 2007). They were also requested to assess the appropriateness of the wording of the 13 items in the original English version to the Sri Lankan context and to indicate any changes to wording where necessary. Operational equivalence refers to the ability to use a similar questionnaire format, instructions, response scale, and mode of administration as the original scale (Herdman et al., 1998). The expert panel was requested to comment on the appropriateness of the above factors and this activity assured operational equivalence. Having considered the responses of the expert panel, a modified version of Antonovsky's original English questionnaire was then developed.

Semantic equivalence : Semantic equivalence relates to the transfer of meaning across languages (Herdman et al., 1998). Semantic equivalence was achieved by translating the modified original English version into Sinhala, assessing expert opinion on relevance and appropriateness of the Sinhala version and pre-testing the Sinhala version among a small sample of the target population.

Two sworn translators independently translated the questionnaire into Sinhala. These two translators were proficient in both English and Sinhala. A linguist having reviewed and resolved any discrepancies in the two Sinhala translations then produced a "synthesized Sinhala translation" of the questionnaire. The synthesized Sinhala translation of the questionnaire was then back translated to English independently by two other sworn translators who were fluent in both English and Sinhala. These translators were blinded to the original version**.** A third independent linguist synthesized a single English version of the questionnaire after reviewing and resolving any discrepancies that existed in the two English back-translations.

The "synthesized English" translation was reviewed by the supervisors; one an expert in social psychology to verify its resemblance to the concept of the original version. The synthesized English version and the original version did not have any major discrepancies in relation to the overall concept. Therefore, the "synthesized Sinhala version" from which the synthesized English version was derived was assessed for its relevance, appropriateness, and acceptability to be used among the 15-year- old students by a panel of experts**.** This step further established the semantic equivalence of the "synthesized Sinhala version" of the questionnaire. It is recommended to include a specialist in linguistics at this stage, preferably a person who was not involved in the initial translation process (Reichenheim & Moraes, 2007). A panel of 8 experts from the disciplines of Psychology, Sociology, Psychiatry and Public Health and Linguistics assessed the validity of the synthesized Sinhala version of the SOC-13 questionnaire through a modified Delphi technique. An online opinion collection method (E-mail) was used to obtain data. The panel was provided with both the original English questionnaire, the synthesized Sinhala version of the questionnaire, information about the purpose of the study and the evaluation format. They were requested to rate the relevance of each item in the Sinhala version of the questionnaire on a 1 to 4 scale where Score 1 was "not relevant" and Score 4 "highly relevant". A Score of 3 or 4 was considered as an "agreed score". The proportion

of experts who had given a Score of 3 or 4 for each item was calculated. This is considered as I-CVI **(**item-level content validity score) and if it is above 0.83 for an item, that item is considered appropriate to be retained in the scale (Polit & Beck, 2006). The panel was also requested to comment on the appropriateness of Sinhala wording of items to the study context and target group and to suggest changes to the response scale and measurement methods where necessary. The wording of the items was modified according to the experts' opinions at this stage. This modified version of the synthesized Sinhala questionnaire was then pre-tested among a convenient sample of 30 (17 females and 13 males), 15-year-old students attending a Sinhala medium government school in Kandy district to check for its comprehension and clarity. The first author who was the principal investigator administered the self-administered questionnaire to the participants and then conducted structured interviews with the students to determine the acceptability, and comprehension of each item and the feasibility of using the response scale. The time taken to complete the questionnaire was also noted.

Measurement equivalence: The construct validity of the questionnaire was assessed through factor analysis using both Principal Component Analysis (PCA) and Confirmatory Factor Analysis (CFA). A minimum sample size of 200 is required to obtain adequate statistical power for data analysis through PCA and CFA (Kyriazos, 2018). Therefore, a total sample of 400; a minimum of 200 participants each was needed for PCA and CFA. The 400 students were selected from three Sinhala medium government schools in Matale district. Students from Grades 10 and 11 classes who had completed their 15th but not reached the 16th birthday on the date of data collection were selected using a convenient sampling method. Students with cognitive impairments were excluded. To represent the target population both male and female students were recruited.

The reliability of the Sinhala version of the SOC questionnaire was assessed through internal consistency and stability. The sample of 200 which was considered for exploratory factor analysis was also used to determine the internal consistency (Cronbach's alpha) between each item of the questionnaire. To determine stability (test-retest reliability), the questionnaires were re-administered to a sub-sample of 30 students one month apart from the date of initial data collection.

Statistical Package for Social Sciences (SPSS) version 26 was used for data analysis. PCA was performed to identify the number of components that describe the construct of SOC among 15-year-old adolescents in Sri Lanka. Inter-correlations between all items (correlation matrix) and anti-image correlation matrix were calculated to determine the factorability of the items in the questionnaire. The correlation matrix was examined to identify whether a patterned relationship existed among the items. Items with correlations of _+/-0.3 with one or more other items were retained for further analysis whereas items that did not fulfill the criterion ($r \geq 0.3$) were removed prior to factor analysis (Tabachnick & Fidell, 2013). The Kaiser–Meyer–Olkin (KMO) coefficient and Bartlett's sphericity test were used to determine the adequacy of the data for factor analysis. Having an eigenvalue >1 was used as the criterion to determine the number of factors and the cut-off for the factor loading was set as 0.50.

CFA was conducted to assess whether the correlations observed among items (generated component) of the questionnaire were consistent with the latent factor model retrieved through PCA. CFA was carried out using data from the second sample of 200 participants using LISREL version 8.8 (ref). Since the distribution of responses obtained for each item was skewed , Robust Maximum Likelihood (RML) method was carried out for CFA to overcome the issue of the skewed distribution of data (Jackson et al., 2009). Based on the recommendations of Bentler (2007), the model fit of the sample was evaluated using fit indices; RMSEA (Root Mean Square Error of Approximation) a type of Parsimony fit index and CFI (Comparative Fit Index) a comparative fit index. The cut-off values for RMSEA and CFI were considered as ≤ 0.06 and ≥ 0.90 respectively to determine model fit compared to its hypothetical model (Hu & Bentler, 1999).

The reliability of items was assessed using internal consistency (Cronbach's Alpha) and test-retest reliability. Cronbach alpha of at least 0.70 was considered as the cut-off level for adequate internal consistency (Pontekotto & Ruckdeschel, 2007). The questionnaire was readministered to a group of 20 students after a month to test the stability of the scale. Test-retest reliability was assessed using the Spearman r test. The correlation coefficient (spearman's r) of 0.7 or more was considered a satisfactory level of agreement between the scores (Eriksson & Lindström, 2005).

RESULTS AND DISCUSSION

Item and conceptual equivalence

Of the 7 experts, only 2 gave a score of 3 (quite relevant) or 4 (highly relevant) for Item 9 (Does it happen that you have feelings inside you would rather not feel?). Also, only one agreed that Item 11 (When something happened, have you generally found that:1- you overestimated or underestimated its importance, 7- you saw things in the right proportion) should be retained for use in the Sri Lankan context. Therefore, these two items were deleted from the original English version of Antonovsky's questionnaire before the translation process (Table 1).

Regarding the appropriateness of the wording of the original English version to the Sri Lankan context, the experts suggested amendments to the wording of 4 items for better comprehension by 15- year- olds (Appendix I).

Operational equivalence

The experts suggested the use of a 5- point response scale instead of the 7- point scale in the original questionnaire. Therefore, a 5- point scale with responses; 1-never, 2-rarely, 3-sometimes, 4-often, 5-always was considered. They also suggested rephrasing all items to a uniform format for better clarity. Accordingly, all items were rephrased to begin with "How often……?".

Table 1: Ratings of the expert panel on the relevance of items in the original English SOC-13 questionnaire.

Item	E1	E2	E3	E4	E5	E6	E7	Experts in agreement	I-CVI
1	4	3	4	3	4	4	3	7/7	1
2	3	4	4	4	4	4	3	7/7	1
3	4	4	4	4	4	4	2	6/7	0.83
4	4	3	4	4	4	4	4	7/7	1
5	4	4	3	4	4	4	3	7/7	1
6	2	3	3	4	4	3	4	6/7	0.83
7	4	3	4	4	4	4	4	7/7	1
8	2	3	4	3	4	4	3	6/7	0.83
9	**3**	**4**	**2**	**2**	**1**	**2**	**1**	**2/7**	**0.28**
10	4	4	4	4	4	4	4	7/7	1
11	**2**	**2**	**4**	**2**	**2**	**2**	**2**	**1/7**	**0.14**
12	3	4	4	4	4	3	3	7/7	1
13	4	4	4	4	4	3	4	7/7	1
Average proportion of items judged as relevant	0.84	0.92	0.92	0.84	0.84	0.84	0.76		Average I-CVI 0.83

*1- Not relevant, 2- Somewhat relevant, 3- Quite relevant, 4- Highly relevant
E= expert

Semantic equivalence

The questionnaire with 11 items was subjected to the translation process. The proportion of experts who gave a score of 3 or 4 for each item ranged from 0.87-1 and the I-CVI was above the recommended value of .83 for all 11 items of the synthesized Sinhala version of the SOC questionnaire (Table 2).

Item 8 of the synthesized Sinhala version of the SOC questionnaire was modified as suggested by the linguist (Appendix I). The modified version of the synthesized Sinhala questionnaire was used for the cross-sectional survey.

Measurement equivalence - construct validity of the 'Sinhala version of the adolescents' SOC'

The study sample included 400, 15-year-old students from three Sinhala medium government schools in Matale district and 51% were females.

Principal Component Analysis

According to the correlation matrix only 5 of the 11 items of the Sinhala SOC questionnaire (Items 2, 6,9,10 and 11) had a correlation coefficient of at least 0.30 with one or more items. Therefore, the data were analysed including only the items which fulfilled the criterion of >0.3 and the rest of the items (items 1,3,4,5,7,8**)** which did not fulfil the criterion (<0.3) were deleted from the questionnaire at this stage.

KMO measure was 0.708 and above the required value of 0.5 whereas Bartlett's test of sphericity ($\chi 2$ = 112.108, df = 10; $p < 0.001$) was significant. Only one component had an eigen value of >1. Therefore, one component was extracted, and it explained 40.88% variance of the latent factor (Table 3).

According to the factor loadings, a one-factor solution emerged with 5- items with factor loadings ≥0.32. The factor loadings of these five items ranged from 0.547 to 0.708 which implied a fair to good correlation between the extracted component and the relevant item (Table 4).

Confirmatory Factor Analysis

The model revealed a significant model fit for the one-factor model (χ^2 =5.65; $p<0.05$). The alternative model fit statistics for the one-factor model are given in the Table 5.

The culturally adapted 'Sinhala version of the Adolescence Sense of Coherence scale produced a one-factor solution with 5 items which contained at least one item from each of the three dimensions (comprehensibility-items 2 and 6, manageability-item 9 and 11, meaningfulness-item 10) of the original SOC-13 questionnaire and accounted for 40.8% of the total variance of the scale.

Reliability of the 'Sinhala version of the Adolescents' SOC' questionnaire

Internal consistency as assessed by Cronbach's alpha was 0.635. Test-retest reliability assessed using Spearman r correlation coefficient was 0.656 for the total scale. The correlation coefficients were statistically significant at $p < 0.01$ level.

An English translation of the final adapted Sinhala version of the sense of coherence questionnaire is given in Appendix II for the reference of local and international

Table 2: Ratings of the expert panel on the relevance of items in the synthesized Sinhala version of SOC questionnaire.

Item	E1	E2	E3	E4	E5	E6	E7	E8	Experts in agreement	I-CVI
1	4	4	4	4	4	4	3	4	8/8	1
2	3	3	4	4	4	4	3	4	8/8	1
3	4	4	4	4	4	4	2	4	7/8	0.87
4	4	4	4	4	4	4	4	4	8/8	1
5	4	4	4	3	4	4	4	4	8/8	1
6	3	3	4	4	4	3	4	4	8/8	1
7	3	4	4	4	4	4	4	4	8/8	1
8	2	4	3	4	4	4	4	3	7/8	0.87
9	4	4	4	4	4	4	4	4	8/8	1
10	4	4	4	4	4	4	4	4	8/8	1
11	4	4	4	4	4	4	4	4	8/8	1
Average proportion of items judged as relevant	0.9	1	1	1	1	1	0.9	1		Average I-CVI 0.97

*1- Not relevant, 2- Somewhat relevant, 3- Quite relevant, 4- Highly relevant
E=expert

Table 3: Total variance explained by the extracted components.

Component	Total	Initial eigen values % of variance	Cumulative %
1	2.044	40.887	40.887
2	0.980	19.604	60.492
3	0.740	14.794	75.285
4	0.639	12.773	88.059
5	0.597	11.941	100.00

Table 4: Factor loadings of the variables.

Item*	Component 1
Item 2 How often were there occasions when the behavior of people whom you have known very well surprised you?	0.547
Item 6 How often do you feel that you were unable to take the next step when facing an unfamiliar situation?	0.587
Item 9 Even people with very strong personalities feel defeated on some occasions. How often have you had similar feelings in the recent past?	0.640
Item 10 How often do you think there is no meaning in the daily activities you engage in?	0.699
Item 11 How often do you have feelings that you're not sure whether you could manage day to day activities?	0.708

** Item number is the equivalent of the modified version of the synthesized Sinhala questionnaire (11 items) which was used in the cross-sectional survey*

Table 5: Model fit statistics of the one factor model.

Model	Absolute fit indices	Comparative indices	Parsimony fit indices
	X^2	CFI	RMSEA
One factor model with 5 items yielded from PCA	5.65 P=0.32	0.99	0.026

χ2 chi square test – (p> 0.05 desired)
CFI – Comparative fit index (>0.9 desired)
RMSEA – Root mean square error of approximation (<0.05 desired)

researchers. According to regulations, the Society for Theory And Research on Salutogenesis (STARS) holds the copyright to the developed Sinhala version of the sense of coherence questionnaire and can be retrieved from http://www.stars-society.org/ with permission.

DISCUSSION

The SOC-13 scale is the most widely used to assess SOC and has been culturally adapted and validated to be used among non-English speaking adolescents in different parts of the world (Rivera et al., 2013) . In the absence of an adapted Sinhala version of the questionnaire to measure SOC, the original English version of the SOC-13 item questionnaire (orientation to life questionnaire) was culturally adapted and validated for use among Sinhala-speaking adolescents in Sri Lanka.

Item and conceptual validity were assessed by 7 experts. They gave low ratings to 2 items (item 9 and 11) of the original SOC-13 questionnaire. Further both items did not fulfil the expected CVI value of 0.83. Therefore, those two items were considered as irrelevant to Sri Lankan adolescents and only 11 items were considered for translation. Researchers have discussed the importance of both the item and conceptual equivalence when assessing the suitability of items of an instrument and the relevance of the overall concept to the study context (Herdman et al., 1998; Reichenheim & Moraes, 2007). However, literature does not provide any evidence pertaining to the assessment of item and conceptual equivalence of SOC scales that have been adapted for use among non-English speaking populations.

Despite evidence on the importance of establishing semantic validity when adapting an instrument to a diverse cultural context (Herdman et al., 1998), information is lacking on the specific procedures that should be followed to establish this aspect. Experts who participated in this study suggested changes to the wording of 4 items of the original scale for better comprehension. For example, Item 10 in the original scale states "Many people even those with a strong character – sometimes feel like sad sacks (losers) in certain situations. How often have you felt this way in the past?". The experts suggested deleting the words 'sad sacks' as it is not used in the Sri Lankan context. Similarly, when adapting the SOC scale among an Italian population Sardu et.al (2012), had deleted those words in the Italian version as well. Additionally, to maintain uniformity, it was suggested to word the items so that they begin with "How often". In their study, Ayo-Yusuf et al. (2009), had also rephrased all items in the scale to begin with the words "How often…".

A team of 8 experts including a linguist assessed the semantic validity of the Sinhala version of the questionnaire (11 items). According to expert opinion certain words were amended to suit the context of the present study.

Several modified versions of the SOC scale have been developed by researchers (Mittelmark et al., 2022). According to a systematic review on the validity of sense of coherence scales, there are around 15 different versions of the instruments with items ranging from 3 to 28 and different response scales (Eriksson & Lindström, 2005; Mittelmark et al., 2022). These versions have been considered in many studies that have been conducted among non-English speaking populations. A three-item sense of coherence (SOC) scale was developed to measure SOC in a Japanese population and specifically for use in population surveys due to its ease of administration (Togari et al., 2007). A Norwegian study assessed the psychometric properties of a 9- item SOC scale with a 7- point response scale where the items were derived from the original SOC-29 scale (Klepp et al., 2007). This study was conducted among a rural population of 18- year-olds or older.

The response scales considered in the different versions of the SOC scale differ widely. A 7-point scale was used in the original questionnaire (Mittelmark et al., 2022). However, similar to many other studies (Getnet & Alem, 2019; Idan & Margalit, 2014), the validated Sinhala version used a 5- point Likert type of response scale; "never" to "always". Mellor and Moore (2014) in their study to select the most reliable type of response scale for children found that a 5-point Likert scale ranging from strongly agree to strongly disagree was the most appropriate for children over the age of 10.

Different statistical techniques have been used to assess the factor structure of SOC scales (Frenz et al., 1993; Getnet & Alem, 2019). The present study used both PCA and CFA. When the 5-items with r>0.3 extracted from the correlation matrix were subjected to PCA, they yielded a single factor solution which accounted for 40.8% of the total variance of the scale. The 5- items represented at least one item from each of the three dimensions of the original version of the English SOC-13 questionnaire. The findings of the present study agree with the arguments of Aron Antonovsky, the founder of the concept of SOC, who has stated that the SOC construct should be considered as a one-factor construct with three different dimensions namely comprehensibility, manageability and meaningfulness. Similarly, the Hebrew version of the SOC-13 scale which was the first to be adapted to another language and when tested among Israeli adolescents produced a single-factor model (Antonovsky & Sagy, 1986). A study conducted among South African adolescents yielded, a single-factor solution with 6- items representing at least one item from each of the dimensions of the original version and the factor accounted for 35% of

the total variance of the scale (Ayo-Yusuf et al. 2009). On the contrary, the 5 items of the Sinhala version of the SOC questionnaire were only capable of explaining 41% of the construct SOC. This warrants further investigations into other dimensions which may attribute to the development of the construct of SOC in Sri Lankan adolescents.

The internal consistency of the original questionnaire based on Cronbach's alpha ranged from 0.70 to 0.92 but the internal consistency of the present questionnaire was lower than those values (Cronbach's alpha=0.635). However, it is consistent with those reported in other studies (Ayo-Yusuf et al., 2009, Antonovsky & Sagy, 1986). Cronbach alpha of 0.7 or above is considered as acceptable reliability (Pontekotto & Ruckdeschel, 2007). However, Pontekotto and Ruckdeschel (2007) argue that it is not statistically justifiable to have such strict cut-off values. According to them the magnitude of coefficient alpha is affected by several factors such as the number of items, the average inter-item correlation, and the standard deviation of an obtained score from research participants. The authors claimed that even if all the other factors are fulfilled, if the number of items in a scale is low as 5, it is a feat for such a scale to have a coefficient alpha of 0.70 than it is for a 10-item scale. Therefore, according to recent evidence values of 0.6-0.7 could be considered as appropriate (Pontekotto and Ruckdeschel, 2007). Although the internal consistency was less than the acceptable cut-off value of 0.7, considering the above arguments, the reliability of the Sinhala version of adolescents' SOC could be regarded as satisfactory.

There are considerable variations in test-retest reliability values between studies. Honkinen et al. (2008) found that the differences in SOC scores measured at 15- and 18 years of age were not significant. On the other hand a systematic review reported that the test-retest reliability of the SOC-13 item scale ranged from 0.69-0.72 over a year. In the present study the test-retest reliability was measured one month apart and showed moderate correlation (correlation coefficient 0.65) and the strength of this association was significant. Test-retest reliability is influenced by both the dynamic nature of the construct being measured over time and the duration of the time interval (Haynes & Lench, 2003). Although longitudinal data show considerable stability of the construct over time (Honkinen et al., 2008 ; Antonovsky, 1987) has pointed out that SOC fluctuates during adolescence. Further, test-retest reliability assessment requires two administrations of the questionnaire during a period when no change in the target concept should have occurred (Polit, 2014). The present study was conducted during the Covid-19 pandemic which was a challenging time for all. Therefore, despite the short time between test-retest period, the moderate correlation between the two-time points could be attributed to challenges faced by adolescents due to the Covid-19 pandemic such as intermittent closure of schools, being away from classmates and perhaps perceived fear of getting infected with Covid-19

CONCLUSION

The Sinhala version of the adolescents' sense of coherence scale is a valid and reliable instrument to measure the construct sense of coherence among 15-year-old Sinhala-speaking students in Sri Lanka. When ` item and conceptual equivalence were assessed, a 11-item version of the questionnaire was produced following the exclusion of two items which gave a I-CVI value of <0.83. The final questionnaire consisted of 5 items with a single factor structure, and they included at least one item from the three different dimensions of the original questionnaire namely comprehensibility, manageability, and meaningfulness. It demonstrated an acceptable construct validity with a c^2 = 5.65; p=0.32, CFI=0.99 and RMSEA=0.026. A 5-point-likert scale was used to record the responses instead of the 7-point-likert scale in the original SOC-13 item scale. The reliability of the Sinhala version of the adolescents' sense of coherence was satisfactory.

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DECLARATION OF CONFLICT OF INTEREST

There is no conflict of interest

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Appendix I

Item 4

Original item: Until now your life has had:

1 2 3 4 5 6 7

1 - no clear goals or purpose at all 7 - very clear goals and purpose

Suggested changes in wording; How often do you perceive that doing things you do every day is a source of great happiness and fun?

Always to Never scale

Item 6

Original item: Do you have the feeling that you are in an unfamiliar situation and don't know what to do?

Suggested changes in wording; Things in life are frequently changing and we often encounter unfamiliar situations.

How often do you feel you have been in such situations without knowing what to do next?

Item 8

Original item: Do you have very mixed-up feelings and ideas?

Suggested changes in wording: How often do you feel that your feelings and ideas are mixed-up?

Additionally, an amendment was suggested to a Sinhala word in the item 8 by the linguistics expert.

Item 10

Original item Many people – even those with a strong character – sometimes feel like sad sacks (losers) in certain situations. How often have you felt this way in the past?

Suggested changes in wording; Many people, even those who are strong, sometimes lose hope in certain situations.

How often have you lost hope in the past?

Appendix II

English translation of the final validated Sinhala version of the adolescents' SOC questionnaire

This questionnaire includes different occasions that we encounter in our life. There are 05 possible answers for each question. Circle the answer that is most relevant to you.

If your answer is number 1, circle number 1. If your answer is number 5, circle number 5. If your answer is not among the given answers, circle the number of the answer which is most relevant to your answer.

Please provide one answer for each question.

01 How often have there been occasions when the behaviour of people whom you have known very well surprised you?

Always	Often	Sometimes	Rarely	Never
1	2	3	4	5

02 How often have you felt that you were unable to take the next step when facing unfamiliar situation?

Always	Often	Sometimes	Rarely	Never
1	2	3	4	5

03 Even people with very strong personalities feel defeated on certain occasions. How often have you had similar feelings in the past?

Always	Often	Sometimes	Rarely	Never
1	2	3	4	5

04 How often have you felt that there is no meaning in the daily activities you engage in?

Always	Often	Sometimes	Rarely	Never
1	2	3	4	5

05 How often have you felt that you were not able to manage your day-to-day activities?

Always	Often	Sometimes	Rarely	Never
1	2	3	4	5