

Original Research



University Health Risk Behaviour (UniHRB) Inventory (Sinhala): a tool to assess common health risk behaviours among undergraduates in Sri Lanka

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Abstract

Introduction: The degree of health risk behaviour (HRB) among undergraduates has not been researched extensively in Sri Lanka and there is no tool available to assess common HRBs in a university setting.

Objectives: To develop, translate and validate a tool to measure common HRBs in Sinhalese second-year undergraduates in Sri Lanka

Methods: The UniHRB-Inventory (Sinhala) was developed using a seven-step design process for tool development. An extensive literature review, nine key informant interviews (KII), and five focus group discussions (FGD) were carried out. A combination of deductive and inductive methods was used to define the domain and identify the questions to assess. Content and consensual validity was assessed using the modified Delphi process. A validation study was conducted among 666 second-year undergraduates at the University of Kelaniya selected using stratified-cluster sampling. Construct-validity of UniHRB-Inventory-Sinhala was assessed using Principal Component Analysis (PCA) (n=333), Confirmatory Factor Analysis (CFA) (n=333), multi-trait scaling analysis and convergent validity assessment (n=80). Internal consistency and test-retest reliability was assessed in a sub-sample (n=25).

Results: There has been a deficit of choices for adapting an HRB tool for undergraduates in Sri Lanka. Violence and injuries, sexual risk behaviours, addictions to mobile phones and the internet are common among undergraduates. Students' dismissive attitude towards violence and neglecting health behaviours, such as sleep deprivation and poor hygienic practice, were highlighted as important aspects of HRBs. The UniHRB-Inventory (Sinhala) with 70 items showed good face, content and consensual validity. A seven-factor model was identified through PCA, which was confirmed through CFA. UniHRB-Inventory domains and sensation seeking scale (SSS) total score showed correlations between 0.39-0.67. Cronbach's alpha coefficient of 0.77 and test-retest reliability coefficients of seven domains ranging between 0.74-0.82 indicated high reliability.

Conclusions & Recommendations: The newly developed UniHRB-Inventory (Sinhala) is a valid and reliable tool to assess common HRBs among undergraduates in Sri Lanka.

Keywords: health-risk-behaviour, Inventory, Sri Lanka, tool, undergraduates

Introduction

For the last two decades, studies have reported on changes in the HRB of young university students showing a trend toward a less healthy lifestyle (1). Monitoring of these behaviours is essential to identify priority areas and plan effective interventions to reduce the occurrence of non-communicable diseases (2).

In developed countries, university statistics are available on HRBs as there is systematic record keeping. Youth Risk Behaviour Surveillance Survey (YRBSS) has been used to determine the prevalence of accidental injuries and violence, tobacco use, alcohol and other substance use and sexual habits in the USA (3). Based on this tool, the National College Health Risk Behaviour Survey (NCHRB) questionnaire has been developed in 1995 (4). Furthermore, the American College Health Assessment (ACHA) developed the National College Health Assessment (NCHA) in year 2000. Presently, this is used as a web-based survey with several user-friendly measures (5). In addition, Andrew Steptoe and his colleagues developed and used Health Behaviour Index (HBI) to compare HRBs among undergraduates in European countries (1). Karl Pelzer and Supa Pengdid used this tool in countries of Association of South East Asian Nations (ASEAN), America, Africa and a few Asian countries like India and Kyrgyzstan (6-10) with few modifications.

The Health Behaviour Checklist (HBC), the Health Promoting Lifestyle Profile (HPLPII), the Healthy Lifestyle Scale for University Students (HLSUS) and the Domain Specific Risk-Taking Attitude (DOSPERT) are a few validated tools for assessing HRB (11-14). With appropriate cultural modifications, HPLPII has been used in a number of nations, including Japan, China, Hong Kong, Malaysia, India, and Mediterranean nations (15-19). Among these questionnaires, some had been developed for measuring several HRBs, while others for measuring only one or few among undergraduates. However, due to cultural variation, HRBs are conceptualised differently in different nations, therefore there is no universal questionnaire

developed for analysing HRBs globally (20). For instance, in gun violence, carrying weapons, sunbathing and tanning dependencies can be seen widely in Western countries, while hookah/water pipe are used in the Mediterranean region but not so commonly seen in the Sri Lankan context (20-21).

In Sri Lanka, the impact of multiple risk behaviours among youth including undergraduates has not yet been sufficiently explored. There have been individual studies conducted in Sri Lanka to assess sexual risk behaviours, dating violence, harassment, smoking and alcohol use, sleeping and internet addiction (22-27), however most were limited to a single risk behaviour. There is no single comprehensive tool available to assess multiple HRBs among undergraduates in Sri Lanka. The evidence generated by this research could be used to highlight the practical importance of a surveillance system and to fill this gap. Therefore, the objective of this study was to develop, translate and validate a tool to assess common HRBs among undergraduates in Sri Lanka.

Methods

A seven-step survey scale design process for medical education research (28) was followed to develop the UniHRB-Inventory in 2019.

Step 1: A literature search was conducted to identify HRBs or acts used by researchers in other countries and tools adapted to measure HRB among undergraduates in Sri Lankan universities using several search strategies, both manually and electronically through Google Scholar and PubMed databases.

Step 2: A qualitative study was carried out using FGDs with undergraduates and KII with vice chancellor, deans, senior lecturers, student counsellors, university medical officers to explore how the population of interest conceptualizes and describes the construct of HRB. The qualitative data analysis was carried out using thematic analysis simultaneously with data collection.

Step 3: Finalizing the construct of each risk behaviour in the questionnaire was done by the PI,

the supervisors, three public health experts, a sociologist and a psychologist following a consultative meeting.

Step 4: A combination of deductive and inductive methods was used to define the domain and identify the questions to assess HRBs. A consultative meeting was conducted with a panel of five experts from community medicine, psychology and sociology to develop tentative items of HRBs, using information gathered from literature review and qualitative study. Items that had more than 50% agreement were selected. Experts agreed to use the period of recall from the point of university entry. The scoring was developed based on the following three significant aspects of behaviour: nature of the behaviour, frequency of the occurrence and short-term consequences/complications caused by the behaviour.

Step 5: Modified Delphi Technique was used to ensure the content and consensual validity of questionnaire, with experts representing community medicine, psychology, psychiatry, venerology, medicine, sociology and health promotion. This iterative procedure was conducted in three-rounds. In the first round, each item was assessed for relevance in assessing HRBs, appropriateness and relevance in local context based on a five-point Likert-scale. Additionally, expert opinion was inquired on the frequency measures developed by the PI following the consultation meeting. If an item received an average mark of less than four by the expert panel, it was removed from the questionnaire. The experts accepted the final inventory of HRBs with 70 items at the MDT as having a good content validity. The UniHRB-Inventory was translated to Sinhala from the English version using the forward-backward translation methodology.

Step 6: Cognitive interviews were carried out by the PI using immediate retrospective probing. This tool was pretested for among 20 undergraduates in the University of Colombo.

Step 7: A cross-sectional validation study was conducted among second-year undergraduates in three randomly selected faculties of the University of Kelaniya, selected using multi-stage cluster sampling. Those in one particular academic year in four main academic streams and undergraduates

where there were more than 100 students enrolled in general degree programmes were selected. Non-Sri Lankan clergymen, undergraduates, absent on the day of data collection and those from medical/allied-health courses were excluded. In concurrence with other studies (29), the minimum required sample size was taken as 300 for PCA and an additional 300 for CFA and hypothesized scale structure. The sample size for convergent and discriminant validity was calculated in order to identify the correlation between HRB and sensation seeking scale (SSS) (30). With 10% non-response rate, the sample size was determined as 666. Thus, the cluster size was 30, which was the minimum number in a tutorial group and the number of clusters needed was 22. Clusters were allocated proportionately based on the total number of undergraduates in the selected undergraduate courses.

PCA: The inter-item correlation matrix and anti-image correlation matrix were calculated to assess the factorability of the data. Factor structure and factor loadings after varimax-rotation were assessed. Factors with an eigen value of more than one was selected. A Scree plot was also inspected. The items were observed for their factor coefficients, and more than 0.4 was considered well-loaded.

CFA: Compatibility was checked using the following statistical assumptions and tests prior to conducting the CFA: multivariate normality, linearity, outliers, adequacy of sample size, inter-item correlation and multicollinearity. CFA was carried out on the covariance items of the HRB items. The model parameters were estimated using the Robust Maximum Likelihood method, using LISREL 8.8.

Multi-trait scaling analysis was used to assess the scale structure identified through PCA and CFA. Convergent validity was assessed using the correlation with SSS in a sub-sample of 80 participants.

Reliability: Test-retest analysis was conducted among 25 second-year undergraduates from the

validation study identified randomly after two weeks interval.

Results

Step 1: There were no scales validated in local settings to assess HRBs among undergraduates. A few local studies on individual HRBs among undergraduates had used scales that were limited to a few HRBs. Scales used in other countries had focused only on specific aspects of HRBs among undergraduates in Western countries and were not comprehensive assessments of common HRBs of undergraduates in local settings.

Step 2: Participants in the FGDs agreed that violence and injuries, sexual risk behaviours, and addiction to mobile phone and the internet are common among undergraduates; that a student's dismissive attitude towards violence should be incorporated as a risk behaviour; and that victimization to violence was leading to the practice of perpetration. Cyberbullying and dating violence were seen as forms of harassment, whereas carrying weapons and gun violence were not so common among undergraduates in Sri Lanka. When considering road safety measures, they follow road rules, however they demonstrate road rage while driving. During KIIs, neglecting health behaviours, such as sleep-deprivation and poor personal-hygienic practice of undergraduates were highlighted as important aspects of HRBs. However, the majority of FGD participants did not believe that poor diet and lack of physical activity were specific to undergraduates to consider them as university acquired behaviours. Tanning dependence, exposure to the sun, use of skin-lightening products, body imaging and eating disorders, and online shopping were not seen as HRBs among undergraduates.

Steps 3 and 4: A comprehensive list of indicators was prepared, by merging the results of the literature review and KII/FGD by the PI. Out of the items which had more than 50% percentage agreement following consultative meeting, 90 items were selected for expert validation.

Step 5: The study instrument was modified based on the scores given by the expert panel for each item. It was decided to convert the questions into first-

person tense as per the recommendation by the expert panel. Out of the 90 items, 29 were retained in the first round of MDT, while 28 items were modified and 15 new items were added. Experts agreed that each behaviour should be enquired using five response categories in Likert scale. Five items assessing sleeping behaviour and seven items assessing sexual behaviour were converted to a six-point Likert scale. There were 70 items after completion of the third round.

Step 6: Following the cognitive interviews, it was decided to use English terms given in Sinhala wherever possible. The median time taken to complete the tool was 25 minutes (IQR: 22.5, 27.5 minutes).

Step 7: Socio-demographic characteristics of the sample selected for the validation study are given in Table 1. Their overall response rate was 92.3%.

PCA: Sexual risk behaviour items showed binary distribution; therefore, all 18 items of sexual risk behaviours were removed before performing factor analysis. PCA was conducted among 52 items to identify the underlying component structure (Table 2). Bartlett's test of sphericity was significant at $p < 0.01$ ($\chi^2 = 17561.28$; $df = 1431$; $p < 0.001$) and KMO measure of sampling adequacy was 0.656, which was above the expected level of 0.6. These confirmed the factorability of the data. PCA following rotation identified 14 relevant factors with eigenvalues greater than one, explaining 74% of the variability ranging between 11.267 to 1.084. Variables with loadings > 0.4 are bolded (Table 2). Examination of the individual factor loadings revealed that the items were initially grouped into a 14-domain model. This was also confirmed by the Scree plot.

CFA: The CFA carried out on the covariance matrix of the HRB items is shown in Table 3. Seven-factor model obtained by PCA to the structure of the HRB was tested initially to assess the fitness, in which all items were allowed to load according to the components received following PCA. Next, a six-factor model, where dismissive attitude towards violence was combined into violence and aggression domain was tested to assess model-fit. Next, three items of the latent variable of "undue risk" which was a new domain formed with three different components of the developed scale, was

deleted and a six-factor model with three items deletion was also tested for model-fit. There was no major change in the Chi-Squared value and relative fit indices when the modification was done. Seven factor model shows the highest satisfactory indices, including all significant factor loadings ($p < 0.05$). All correlations among factors were significant ($p < 0.05$) ($\chi^2 = 104.58$; $df = 1253$; $p = 1.00$; $RMESEA = 0.00$) in the path diagram.

Multi-trait scaling analysis: Confirmed convergent validity for all 52 items in the seven sub-scales, where each item showed a statistically significant correlation of 0.4 or more with its own sub-scale. Discriminant validity was also evident for all 52 items, where each item correlated more strongly with its own sub-scale than the other six sub-scales. Further, evidence for item discriminant validity was shown by 100% scaling success rate (Table 4).

Convergent validity: The correlation coefficients between UniHRB-Inventory and SSS total score

ranged between 0.389 to 0.671 and seven sub-scale of UniHRB-Inventory and four sub-scale SSS ranged from 0.208 to 0.759. Undue risk taking has highest correlation ($r = 0.671$) with total SSS and harmful internet ($r = 0.582$) and substance use ($r = 0.539$) rank next. Unhealthy sleeping and poor personal hygiene had lower, but significant correlation with SSS total score. Among the seven sub-scale of UniHRB-Inventory, undue risk taking has high correlation with thrill and adventure seeking (TAS) ($r = 0.759$) and experience seeking (ES) ($r = 0.511$), low correlation with disinhibition (DIS) ($r = 0.217$) and boredom susceptibility (BS) ($r = 0.316$). On the other hand, substance use was with high correlation with DIS ($r = 0.64$) and ES ($r = 0.526$) and low correlation was observed with TAS ($r = 0.208$) and BS ($r = 0.401$), respectively. Internet use had higher correlation with ES ($r = 0.618$) and low correlation with other domains of SSS.

Table 1: Socio-demographic characteristics of the sample of undergraduates

Socio-demographic characteristics		PCA sample (n=313)		CFA sample (n=302)	
		No.	%	No.	%
Age (years)	20-22	157	50.2	145	48.0
	23-25	140	44.7	104	34.4
	27-29	16	5.1	53	17.5
Sex	Male	198	63.2	153	50.7
	Female	115	36.8	149	49.3
Ethnicity	Sinhala	283	90.4	248	82.1
	Tamil	15	4.8	31	10.3
	Muslim	15	4.8	23	7.6
Religion	Buddhism	272	86.9	225	74.5
	Hindu	12	3.8	30	9.9
	Islam	15	4.8	23	7.6
	Catholic	14	4.5	24	7.9
Civil status	Married	12	3.8	3	0.9
	Unmarried	301	96.1	299	99.0
Faculty	Humanities	121	38.6	139	46.0
	Social Science	113	36.1	92	30.5
	Science	79	25.2	71	23.5

PCA=Principal Component Analysis; CFA=Complementary Factor Analysis

Both sleeping behaviour ($r=0.514$) and hygiene ($r=0.655$) domains had high correlation with BS respectively, while low correlations were observed in TAS, ES and DIS sub-scales of the SSS.

Reliability: Cronbach's alpha value was 0.775 and the significant Spearman correlation-coefficients ranged between 0.74 and 0.82.

The finalised UniHRB-Inventory is given in Annexure 1.

Discussion

The UniHRB-Inventory was developed, translated and validated, adopting the triangulation process in the absence of a gold-standard method to determine criterion-validity. Hence, face, content, consensual and construct validity were assessed. Fifty-two items that underwent PCA were allocated into 14 new components, which explained 74% of the variability and those were meaningfully combined into seven components. The original seven-factor model obtained following PCA and the six-factor model and six-factor model with three-item deletions were tested on its fitness to the data. The seven-factor model showed the highest level of satisfactory absolute and relative fit indices.

The HPLP II, HLSUS, HBC and DOSPERT scales provide eight-, six-, five- and four-factor models following EFA (11-15). Both HPLP II and HLSUS scales were based on health promotion model that assessed health promoting lifestyle behaviours among undergraduates. In contrast, the present study only evaluated HRBs among undergraduates, which was covered under one domain called health responsibility in HPLP II (13). The HBC proposed a hierarchical model that revealed two main domains. One broad component of preventive health behaviours contained two specific parts: fitness management habits and accident control behaviours. The second broad category, risk taking behaviours was divided into two subcategories: risk taking in traffic and the use of potentially dangerous drugs (12). The content covered in this domain is similar to undue risk taking and risky substance use in the

present study.

The EFA showed an eight-factor instrument with 55% of the variation in the 38-item HLSUS. They are exercise, regular, nutrition, health risk behaviour, health responsibility, social support, stress management and life appreciation (14). The HRB domain contains items assessing smoking, alcohol, long time computer and headphone-use. In contrast, the health responsibility domain has items assessing personal-hygienic practices, and under regular behaviour, getting adequate sleep was evaluated. However, aggressive and violent behaviour and dismissive attitude towards violence domains in the present study were assessed more positively under social support and stress management domains. On the other hand, DOSPERT provided a six-factor model that included ethics, investment, health/safety, gambling, social and recreational constructs on six unique domains, with 50.3% of the variance (15). Risky substance use, including binge drinking, cigarette smoking, buying illegal drugs, drunk-driving, seat belt and helmet use, unprotected sex and sunscreen use were assessed under the health/safety domain. At the same time, white-water rafting, chasing out tornadoes or hurricanes by car to take photographs were some forms of undue risk-taking behaviours assessed under the recreational domain. Similarity in the content of HRBs covered in the UniHRB-Inventory and the DOSPERT is evident. This scale further underwent CFA among Chinese undergraduates and showed that the ethical, recreational, health/safety and gambling domains remained intact while items from the social and investment domains were composed into one component (32).

HLSUS scale was validated among Ecuadorian undergraduates giving a four-factor model (33). HPLP II was validated among Malaysian undergraduates giving rise to a three-factor model assessing nutrition, physical activity and health responsibility (34). Multi-trait scaling analysis of the HRB tool confirmed item convergent validity and item discriminant validity for all 52 items, where each item correlated more strongly with its own sub-scale than with any other six sub-scales.

Convergent and discriminant validity assessed using UniHRB-Inventory and SSS showed a significant positive correlation between HRBs and SSS ($r=0.39-0.67$). This was consistent with the findings of Safa et al. (2020), which showed a significant association with sensation seeking and risky behaviours (35). The present study showed a significant positive correlation with undue risk taking ($r=0.7$) and aggressive and violent behaviour ($r=0.4$) with TAS (45). ES significantly correlated with undue risk ($r=0.5$), substance use ($r=0.5$) and harmful internet use ($r=0.6$), while DIS significantly correlated with risky substance use ($r=0.6$) and BS correlated with unhealthy sleeping ($r=0.5$) and poor personal hygiene ($r=0.6$) (36-37).

With regards to reliability, the overall tool exceeded Nunnally's criteria of 0.7. Higher Cronbach's alpha has been reported with other tools such as HLSUS (0.892) and HPLP II (0.943) (33-34). Test-retest reliability resulted in a correlation coefficient between 0.74 and 0.816 for all domains. In comparison, HLSUS, YRBS and HBC (4, 12, 14) showed higher reliability following repeated

administration.

Limitations

Cut-off score to determine the HRBs was based on expert opinion, is not valid as criterion measures. Since undergraduates from medical and allied health courses were excluded since they were familiar with the consequences of HRBs and their outcomes, was considered as another limitation. Self-reporting might have led to under reporting of values. Similarly, fear of retaliation would have also prevented perpetrators from reporting. Self-reporting, however, is preferable to utilizing interviewers, as there will be significant under-reporting due to social desirability bias. Also, as the topics discussed were sensitive, there may have been deliberate hiding of information. Therefore, the actual HRBs may be higher than the reported.

Conclusions & Recommendations

The UniHRB Inventory (Sinhala version) is a valid and reliable tool to assess common HRBs among undergraduates in Sri Lanka. It has a seven-factor model and was verified to have an acceptable level of face, content, consensual and construct validity. It showed convergent validity indicated by correlations with the SSS. Reliability was confirmed with high internal consistency and test-retest reliability for all seven domains. Therefore, the newly developed UniHRB-Inventory (Sinhala) would be useful in surveillance of HRBs in youth.

Public Health Implications

- This tool measures multiple common HRBs among undergraduates. It is valid and reliable to be used in other similar higher educational institutions such as vocational training centres, private campuses and institutions in lower resource settings.

Author Declarations

Competing interests: The authors declare that they have no competing interests.

Ethics approval and consent to participate: Ethics approval obtained from the Ethics Review Committee of the Postgraduate Institute of Medicine, University of Colombo (Reference No: ERC/PGIM/2019/13).

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Author contributions: FF is the principal investigator and was involved in designing the study, conducting KIIs and FGDs and statistical analysis; RC was involved in coordinating FGDs and data collection; IN and DS were the supervisors and provided technical guidance and overall supervision; FF drafted the manuscript and IN and DS did proof reading.

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