Mental health of undergraduate distance learners: a cross-sectional study

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Abstract

Purpose – Mental health is as important as physical health and new university entrants report high prevalence of depression. In open and distance learning (ODL), students must manage both work and studies. Those who are unable to effectively balance these aspects may experience negative outcomes such as dropping out, distress and physical health problems. Therefore, the study aims to investigate psychological distress amongst distance-learning undergraduate students to gather evidence for recommending necessary interventions.

Design/methodology/approach – A cross-sectional study was conducted using depression, anxiety, stress scale (DASS-21). Participants were undergraduate students from the Open University of Sri Lanka (OUSL). The students' socio-demographic details, history of physical and mental illnesses were also recorded.

Findings – According to scoring, 51% of the sample was categorised as "psychologically distressed" relating to the anxiety levels they reported whilst depression (35%) and stress remained (20%) at low levels. The three-factor structure of DASS-21 was also confirmed with reliability scores of 0.8 obtained for all three sub-scales.

Research limitations/implications – The limitations were low-response rate (less than 50%) and inability to provide causal explanations for psychological distress. Further research could address these.

Practical implications – The current research identified anxiety as a psychologically distressing factor for ODL students with the use of a reliable screening tool. Therefore, exploring reasons and interventions to help reduce anxiety could be developed.

Social implications – Majority of distance learners are contributing to a country's economy whilst learning to improve their current socio-economic status. Therefore, addressing these negative impacts is important.

Originality/value – The study explored ODL students' psychological distress and highlighted the need to identify causes and development of support systems to enhance mental well-being.

Keywords Mental health, Open and distance learning (ODL), Distance learners, Psychological distress, Undergraduates, DASS-21

Paper type Research paper

Introduction and overview

According to the World Health Organization (WHO), mental health is one of the most ignored areas in the field of public health and there are almost one billion people who suffer from a mental disorder (WHO, 2020). Mental health has been recognised within the standard definition of health also as health is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 2020). Therefore, mental health is an important factor in our overall health; when investigating the data across the globe, it

indicates that mental disorders and substance use disorders are the leading cause of disability worldwide that can lead to many socio-economic problems and optimal individual functioning (Global Burden of Diseases [GBD] 2017 Collaborators, 2018).

Amongst mental health issues, depression, anxiety and stress related problems are identified as most common due to the prevalence rates worldwide (Ramón-Arbués *et al.*, 2020). When considering the profile of individuals who are more likely to suffer from such mental health issues, the university students or student community has been highlighted in recent findings as a significant group that requires further research and understanding. Especially, mental health of university students is recognised internationally as an important public health issue (Al Saadi *et al.*, 2017; Cheung *et al.*, 2020; Higuchi *et al.*, 2016; Liu *et al.*, 2019; Ramón-Arbués *et al.*, 2020), and the health of university students has been the subject of increasing focus in recent years in many countries (Ajmal and Ahmed, 2019; Bruffaerts *et al.*, 2018). Therefore, investigating the mental health issues prevalent amongst university students is becoming an important consideration within society as universities aim to develop graduates who are not only skilled and educated but also physically and mentally strong to undertake the challenges of current world.

The challenges of current world are varied from geo-political to socio-economic and to technology induced changes have overwhelmed human beings, as it has exerted an additional strain on mental health of individuals in society. The manifestations of these strains are visible when considering the prevalence rates of common mental health problems such as depression, anxiety and stress-related disorders. According to previous research, these issues are identified amongst new entrants to conventional universities (Islam *et al.*, 2020; Puthran *et al.*, 2016) as well as in universities offering distance education (Ajmal and Ahmed, 2019). In this regard, the current research was undertaken to investigate the mental-health status of a distance-learning university in Sri Lanka with the aim of exploring the extent of the issues as well as to recommend interventions accordingly.

Amongst various mental health issues that can affect an individual, there are three commonly identified issues known as depression, anxiety and stress related issues. The high prevalence of these issues is clearly visible in society; therefore, it is found within university student cohorts as well. Thus, to address this issue through research, first, it is important to understand and operationalise these mental-health terms and review evidence from previous research on its prevalence globally and within the Asian region.

Depression is known as the "common cold of mental health (Kandhakatla *et al.*, 2018) and it affects about 264 million people worldwide (GBD 2017 Collaborators, 2018)". Usually, the symptoms are depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, poor concentration and, in severe cases, suicidal ideation (WHO, 2017). Similar concerns are raised about anxiety or having anxious feelings accompanied by tension, worried thoughts and subsequent physical changes, like elevated blood pressure (Shamsuddin *et al.*, 2013). This is another common mental health problem presented in mild, moderate and severe levels across all ages as in primarycare settings and depression and anxiety are amongst the most common diagnosable mental health disorders (Shamsuddin *et al.*, 2013). Hence, importance of recognising and treating depression and anxiety cannot be understated, as these conditions can result in a substantial reduction in perceived quality of life. In addition to these two disorders, stress or stress-related issues have taken a forefront because even at mild and moderate levels elevated stress levels can interfere with the normal life, causing fatigue, inability to concentrate or irritability (Ramón-Arbués *et al.*, 2020).

The abovementioned description about depression, anxiety and stress highlights the detrimental effects it can have on an individual as well as on the society. When focussing on the university level, it has shown that it can lead to negative outcomes including increased dropout rates, increased suicidal tendency, relationship problems, impaired ability to work

effectively, burnout and to exacerbate existing physical health problems (Bruffaerts *et al.*, 2018; Ramón-Arbués *et al.*, 2020; Shamsuddin *et al.*, 2013). If the conventional universities are considered, then the entrance to the university is when they first start to become responsible for their own life decisions about health or otherwise, and it has been stated that first-year students especially need to adapt to a new learning environment and cope with academic and social demands of professional training (Uehara, 2010; Islam *et al.*, 2020) to succeed at this environment. Even if it is a conventional setting or a distance education setting, both require students to perform well at academic level and these high levels of academic expectations can be stressful to new entrants and sometimes pose a risk to students' physical and mental health (Shamsuddin *et al.*, 2013). Thus, adapting to an independent life as a student with the expectations about academic achievement can have a significant impact on university students and in distance-education mode; there is an added layer of strain (Barr, 2014) where they lack conventional peer and teacher interactions and sometimes to manage being "an employee" whilst managing challenges of academic life. These challenges are explored within previous research studies, as it can provide a clear indication of the breadth and depth of this problem focussing specifically on evidence from universities of distance education.

Literature review

Previous research studies have indicated high prevalence of depression amongst new entrants (Islam *et al.*, 2020; Puthran *et al.*, 2016), compared to students in other years of study (Chen, 2013; Ibrahim *et al.*, 2013). From a study conducted within a distance-learning university, it was shown that anxiety was a significant factor that influenced student academic performance (Ajmal and Ahmed, 2019). This type of data provide directive to researchers for conducting studies on psychological well-being of undergraduate students, so the outcomes will provide evidence-based data to develop interventions and improve their quality of life at university level (Ibrahim *et al.*, 2013). Amongst the many studies conducted with university students on their psychological and mental health problems, few studies have examined psychological distress related to medical (Jafari *et al.*, 2017; Liyanage, 2017; Puthran *et al.*, 2016; Rekha, 2012) and non-medical undergraduates (Kuruppuarachchi *et al.*, 2002). However, studies that investigate distress using validated psychometric assessments for measuring level of depression, anxiety and stress amongst undergraduate students are limited in Sri Lankan university system. According to a study that used a validated psychometric scale measuring university students' emotional distress, it is recommended that without providing results from a confirmatory factor analysis (CFA), the validity of use for Asian population cannot be confirmed (Oei *et al.*, 2013). Hence, the need for conducting such research is warranted in this region amongst university students using psychometric scales when investigating mental health of this population in Sri Lankan Open University. Therefore, the aim of this study was to explore those undergraduate re-registrants' level of depression, anxiety and stress in the OUSL using a validated psychometric scale. It was expected that the results would provide evidence on the current status of psychological health of these students and it would assist the providing recommendations to develop interventions and support systems to enhance their overall mental health and well-being.

Objectives

(1) To assess the levels of depression, anxiety and stress amongst the undergraduate students;

(2) To determine the association between depression, anxiety and stress with demographic characteristics amongst undergraduate students;

(3) To assess the reliability and validity of the DASS-21 scale instrument to measure the level of psychological distress amongst undergraduate students and

(4) To provide recommendations to address these issues based on the results

Methodology

A cross-sectional study measuring levels of depression, anxiety, stress and associated factors amongst the undergraduate students was conducted.

Participants

Participants who were available during the data collection phase from November 2018–February 2019 were approached by the researchers and the method of sample was convenience sampling. Any student who has completed one year of undergraduate studies and registered at the OUSL were eligible. They were recruited from all the five faculties (education/engineering and technology/health sciences/humanities and social sciences/natural sciences) within the nine regional centres (Colombo, Kandy, Matara, Jaffna, Anuradhapura, Badulla, Kurunegala, Rathnapura and Batticaloa). The OUSL is the only government institution in the island that provides ODL exclusively to its student community. Since 2010, there have been 30,000–40,000 student enrolments each year (OUSL, 2017) and majority (about 62%) are undergraduates. In 2019, there were five functioning faculties of the university and the humanities and social sciences faculty had the highest number of registered undergraduates (44%). From these undergraduates, there are those who register as new students as well as those who would re-register as continuing students. These re-registrants would have completed the minimum number of credits required to move to their next academic year of study and adjust to learning within the distance learning mode.

Inclusion criteria

(1) Students who are registered to follow an undergraduate programme in any faculty/regional centre at the OUSL.

(2) Students registered for undergraduate programmes in their second year of study, after having completed one year of study in the university; because according to research, new entrants have a high prevalence of mental health issues Uehara (2010) and Islam *et al.* (2020) compared to students in other academic years of study (Chen, 2013; Ibrahim *et al.*, 2013). This high prevalence is due to adjustment and adapting to a life as an independent student and it reduces after the first year of study. Therefore, the current study aimed at eliminating this adjustment related high prevalence of mental health issues and select students after this adjustment period to investigate the normal levels of mental health amongst distance-learning university students in Sri Lanka.

Exclusion criteria

(1) Students pursuing certificate/diploma/master's degree or any other higher degrees were excluded.

(2) Students who register as new entrants to undergraduate programmes at the OUSL.

Ethics

Ethical approval was obtained from the Ethics Review Committee for the Social Sciences and Humanities, Faculty of Arts, University of Colombo (ERCSSH/18/02). Permission was

obtained from Vice Chancellor, The OUSL to conduct this study in all regional centres. Participants were provided with information sheets and written informed consent was also obtained.

Data collection tools
The study included two questionnaires and the details of these are given below.

(1) Demographic questionnaire

Participants' socio-demographic characteristics, including age, sex, ethnicity, marital status, employment status and history of illness or taking medicine for psychological illnesses were collected using a questionnaire developed by the researchers.

(2) Depression Anxiety and Stress Scale (DASS- 21)

DASS-21 was developed by Lovibond and Lovibond (1995a) by selecting the items from DASS-42 to reduce the administration time of the scale. This scale was developed to "measure emotional distress" in three dimensions – depression which includes common symptoms such as loss of self-esteem, low mood and lack of energy; anxiety arising from the fear of future negative events and stress identified by the consistent state of over arousal and low-tolerance levels with frustrations in life (Lovibond and Lovibond, 1995a), and it has been administered across cultures (Oei *et al.*, 2013).

DASS-21 analysis and scoring method
DASS- 21 contains seven items for each scale and the result of the assessment is multiplied by two for scoring (Lovibond and Lovibond, 1995a). This scale measures symptoms of depression, anxiety and stress and comprises three sub-scales, respectively (Lovibond and Lovibond, 1995a). Each item is scored on a four-point Likert scale and respondents were required to indicate the presence of these symptom(s) over the past week on the scale. The scoring was allocated from 0 to 3 (0: did not apply at all over the last week, 1: applied to some degree, or some of the time; 2: applied a considerable degree, or a good part of time and 3: applied very much or most of the time). The scores for each sub-scale were taken to identify the levels of depression, anxiety and stress as higher scores indicated severe levels and lower scores related to mild levels or not being symptomatic.

DASS-21 scoring categories
DASS scores were then categorised as "normal", "mild", "moderate", "severe" and "extremely severe" as per the DASS manual and participants with normal to mild range were classified as "psychologically normal (Lovibond and Lovibond, 1995a). Those who reported moderate to extremely severe scores were classified as "psychologically distressed". However, as DASS-21 measures the dimensional quality rather the categorical conception of psychological disorder. Therefore, the results are not considered as equivalent to diagnostic criteria which observes several criteria. The descriptive analysis was conducted to recognize the mean (M) ± and standard deviation (SD) scores. Cronbach's alpha coefficient was calculated to assess the internal consistency and reliability of the DASS-21 of this study population. Statistical analysis was performed using statistical package for the social sciences (SPSS) version 22.0 for the Windows.

Reliability of DASS-21 scale
DASS-21 has previously reached satisfactory reliability and validity levels (Antony *et al.*, 1998; Liu *et al.*, 2019). A study performed comparing clinical versus a non-clinical sample

using DASS-21 showed Cronbach's alpha for reliability coefficient value of 0.94 for depression sub-scale, 0.87 for anxiety sub-scale and 0.91 for stress sub-scale (Antony *et al.*, 1998). Henry and Crawford's study (2005) showed that Cronbach's alpha reliability coefficient value was 0.88 for depression sub-scale, it was 0.90 for the stress subscale and it was 0.93 for the entire scale. However, it should be noted that DASS-21 (Lovibond and Lovibond, 1995a, b) has no "direct implications" to categorize individuals like the Diagnostic Statistical Manual of Mental Disorders (DSM–5; American Psychiatric Association [APA], 2013) or international classification of diseases (ICD) (WHO, 2004; WHO, 2018) which classifies and provides diagnostic criteria for mental health disorders and diseases.

This study used the English version of the DASS-21 scale (Lovibond and Lovibond, 1995a) because the medium of instruction for majority of courses at OUSL was English. However, the researchers also made the DASS-21 Sinhala translation (Rekha, 2012) available for those requesting it, as it has been already validated for university student population.

Sub-scale scores for depression, anxiety and stress were summed as per the DASS manual and were multiplied by 2 to take final score of DASS-21 (Lovibond and Lovibond, 1995a).

Analysis of confirmatory factor analysis
CFA for DASS-21 was also conducted using IBM SPSS Amos version 24.0. This analysis was used to determine whether English version of DASS-21 was a reliable and valid instrument in measuring level of psychological distress in the sample Sri Lankan undergraduates of this study. Hu and Bentler's (1999) guideline of goodness-of-fit indices indicated a good fit between observed data and the target mode and this was used for a model evaluation and cut-off criteria. This criterion following Hu and Bentler's guidelines (1999) are as follows: (1) standardised root mean square residual (SRMR) values close to 0.08 or below; (2) root mean square error of approximation (RMSEA) values close to 0.06 or below; (3) comparative fit index (CFI) values close to 0.90 or greater and (4) Tucker–Lewis index (TLI) values close to 0.90 or greater.

Findings
The results of this study are presented according to the main categories of questions starting from demographic analysis, DASS-21 analysis and CFA analysis within each sub-sections of this main results section.

Demographic analysis
Overall, 1,096 students completed the questionnaire and provided written consent to participate in the study. Table 1 describes the characteristics of the study sample. The sample contained 322 males (29.4%) and 774 females (70.6%). Majority of the participants were employed (71.7%), unmarried (59.7%), Sinhalese (87.3%), Buddhists (84.8%) and were below 30 years of age (67.6%). The questionnaires were administered in all the regional centres with the limitation that attendance for day schools are not compulsory and timetable schedules are different in each of the five faculties. The sample consisted of students representing the faculty of humanities and social sciences (39.0%); health sciences (32.9%); engineering technology (16.6%) natural sciences (10.9%) and education (0.5%).

Basic descriptive statistics for DASS-21 scale for the current sample is provided in Table 2.

DASS-21 descriptive analysis
The overall M of the stress subscale indicated a fairly high M value (12.88) than depression (10.72) and anxiety (10.24). The range of scores was a minimum score of 0 to a maximum score of 42 (i.e. low to severe levels).

Characteristics	N	Percentage
Age		
19–30	741	67.6
31–40	282	25.7
41–50	58	5.3
51–60	15	1.4
Gender		
Male	322	29.4
Female	774	70.6
Marital status		
Married	440	40.1
Unmarried	654	59.7
Ethnicity		
Sinhala	957	87.3
Tamil	96	8.8
Muslim	42	3.8
Other	01	0.1
Religion		
Buddhist	929	84.8
Hindu	87	7.9
Christian	38	3.5
Islam	42	3.8
Employment status		
Employed	786	71.7
Unemployed	306	27.9
Regional centre		
Colombo	348	31.8
Kandy	180	16.4
Kurunegala	191	17.4
Matara	139	12.7
Anuradhapura	128	11.7
Jaffna	61	5.6
Badulla	30	2.7
Batticaloa	08	0.7
Rathnapura	11	1.0
Faculty		
Humanities and social sciences	427	39.0
Natural science	119	10.9
Engineering	182	16.6
Education	06	0.5
Health sciences	361	32.9

Table 1.
Demographic
characteristics of the
participants
(N = 1,096)

Sub scale	Mean (SD)*	95% CI for mean	
		Lower	Upper
Depression	10.72 (7.9)	10.25	11.19
Anxiety	10.24 (7.45)	9.80	10.68
Stress	12.88 (7.83)	12.41	13.34
Note(s): *Range 0–42			

Table 2.
Mean and standard
deviations for DASS-21
sub-scales

The analysis of each sub-scale by gender (Table 3) showed a M difference between males and females as males reported higher scores for each dimension of psychological distress. However, the only statistically significant difference was reported with anxiety scale scores ($p < 0.05$).

The difference between age groups (Table 4) for DASS-21 sub-scales indicated that younger age group had reported higher scores than the above 40 years group across all three dimensions (Table 4). This was further verified by a statistically significant difference between age groups for all three dimensions ($p < 0.05$). This pattern of results was also observed when marital status was analysed against DASS-21, indicating unmarried participants reporting significantly higher levels of scores across all three dimensions compared with married participants. When employment status was considered against these three dimensions, the M values indicated unemployed participants reported higher scored for all three dimensions. Only depression scores showed a significant difference between employed and unemployed participants.

In summary, this demographic analysis indicated that gender significantly affected levels of self-reported anxiety levels whilst age of the participant affected all three dimensions of psychological distress with younger participants overall reported a higher score than their older students. Employment also had a significant impact on the level of psychological distress of this sample of participants, as unemployed and individuals who were unmarried also reported higher scores indicating more distress in comparison to their counterparts. This allows researchers to identify the specific groups within a university student cohort who may require assistance with mental health as they responded with higher levels of depression, anxiety and stress levels in comparison to other students.

DASS-21 analysis: psychological distress
This section presents the DASS-21 scale statistics on psychological distress levels, as each sub-scale had seven items and the cut-off points are given in Table 4 with a detailed analysis of the above-mentioned M values for each scale.

When considering the M values for each subscale (Table 2) with the cut-off scores (Table 5) recommended by the DASS scale manual (Lovibond and Lovibond, 1995a), depression and stress scores of this sample remained within the "psychologically normal" levels, as normal to mild level scores are recognised as not symptomatic. However, anxiety levels in the sample have a M value of 10.24, and this value falls into the "psychologically distressed" at marginal

Scale	Males	Mean (SD)	Females	Mean (SD)	F	p
Depression	322	5.73 (4.21)	774	5.22 (3.85)	3.722	0.054
Anxiety	322	5.52 (3.95)	774	4.97 (3.64)	5.064	0.025
Stress	322	6.53 (4.14)	774	6.40 (3.83)	0.240	0.624

Table 3. DASS-21 scores by gender

	Age groups					
	19–30 ($n = 741$) Mean (SD)	31–40 ($n = 282$) Mean (SD)	41–50 ($n = 58$) Mean (SD)	51–60 ($n = 15$) Mean (SD)	F	p
Depression	5.69 (4.05)	4.87 (3.78)	4.36 (3.38)	3.00 (2.44)	6.247	0.002
Anxiety	5.42 (3.84)	4.60 (3.48)	4.36 (3.29)	3.73 (3.28)	4.881	0.002
Stress	6.72 (3.96)	6.04 (3.73)	5.39 (4.04)	4.33 (3.67)	5.069	0.000

Table 4. DASS-21 scores by age group

levels as 10–14 score range for anxiety is labelled as moderate levels of anxiety and those with moderate to extremely severe are identified as "psychologically distressed".

Distribution of participants based on the dimensions of DASS-21 for this sample is shown in Table 5. Depression and stress within the distressed levels in the current sample are much less, as its 34 and 20%, respectively. However, depending on the cut-off scores for anxiety, exactly half of the study population (50.96%) could be identified at "psychologically distressed". Therefore, nearly 51% of students reported anxiety-related emotions; but from those identified as psychologically distressed, majority scores were at moderate levels than severe or extremely severe levels. This was further explored through their existing mental health conditions as they responded to a question asking them "have you ever suffered from a mental disorder?" The results showed that 22 (7.4%) males and 40 (5.5%) females answered they were suffering from a mental disorder. Furthermore, for the question asking them about taking medication for mental health problems there were 7 males (3.3%) and 9 females (2.0%) who answered that they are taking medicine for mental health problems.

Reliability of DASS-21 was analysed and reliability statistics are shown in Tables 7 and 8, respectively, indicating satisfactory levels for all three sub-scales.

Table 5 displays the results for items-internal consistency and reliability. Cronbach's alpha coefficient for all three sub-scales were 0.82, 0.79 and 0.80 indicating acceptable reliability. Furthermore, M of sub-scales were examined to see the differences between two samples and indicated applicability issues related to certain groups.

Severity levels	Depression	Anxiety	Stress
Normal	0–9	0–7	0–14
Mild	10–13	8–9	15–18
Moderate	14–20	10–14	19–25
Severe	21–29	15–19	26–33
Extremely severe	28+	20+	34+

Table 5.
Recommended cut-off scores for conventional severity labels

	Depression	Anxiety	Stress
Normal	717 (65.42%)	537 (49.04%)	873 (79.66%)
Psychologically distressed	379 (34.56%)	559 (50.96%)	223 (20.34%)
Moderate	267 (24.35%)	313 (28.58%)	151 (13.78%)
Severe	69 (6.29%)	97 (8.86%)	54 (4.92%)
Extremely severe	43 (3.92%)	149 (13.51%)	18 (1.63%)

Table 6.
Prevalence of psychological distress and distribution of participants based on the DASS-21 scoring criteria

Subscales	No of items	Item-internal consistency	Reliability (Cronbach alpha)
Depression	7	0.64–0.90	0.82
Anxiety	7	0.57–0.98	0.79
Stress	7	0.80–1.01	0.80

Table 7.
Item reliability estimates for DASS subscales

3 factor	CMIN/DF	GFI	NFI	TLI	CFI	RMSEA	RMR	SRMR	AIC	p
	4.863	0.880	0.892	0.890	0.912	0.059	0.03	0.05	1036.440	0.000

Table 8.
Fit indices for DASS 3- factor scale

The factor structure of DASS-21 for this study sample is shown in the below CFA diagram (see Figure 1).

The results from the CFA indicated a three-factor structure confirming the original factor structure (Figure 1). The exogenous variables presented depression, anxiety and stress whilst the endogenous variables are categorised as item 1 to 21. The level of Cronbach alpha obtained for depression scale was 0.82, whilst stress and anxiety scales obtained 0.80 and 0.79, respectively (Table 7) confirming high level of reliability. The goodness-of-fit statistics was assessed based on absolute fit test: X^2, CMIN/df ratio (4.863); p value (<0.001) and relative fit tests: goodness of fit index (GFI) (0.880); normed fit index (NFI) (0.892); TLI (0.890) and RMSEA (0.059). The RMSEA similarly suggested that the fitness of the model in question. The value of 0.059 exceeding Figure 0.05 suggested as a cut-off for accepting the model fit. An RMSEA of 0.059 indicated an adequate model fit to the sample.

In summary, the results presented in this results section confirmed the validation of DASS-21 scale for a university population achieving the main objectives of this study. The variations found with demographic factors affecting depression, anxiety and stress are discussed in comparisons to previous research studies in the discussion that follows.
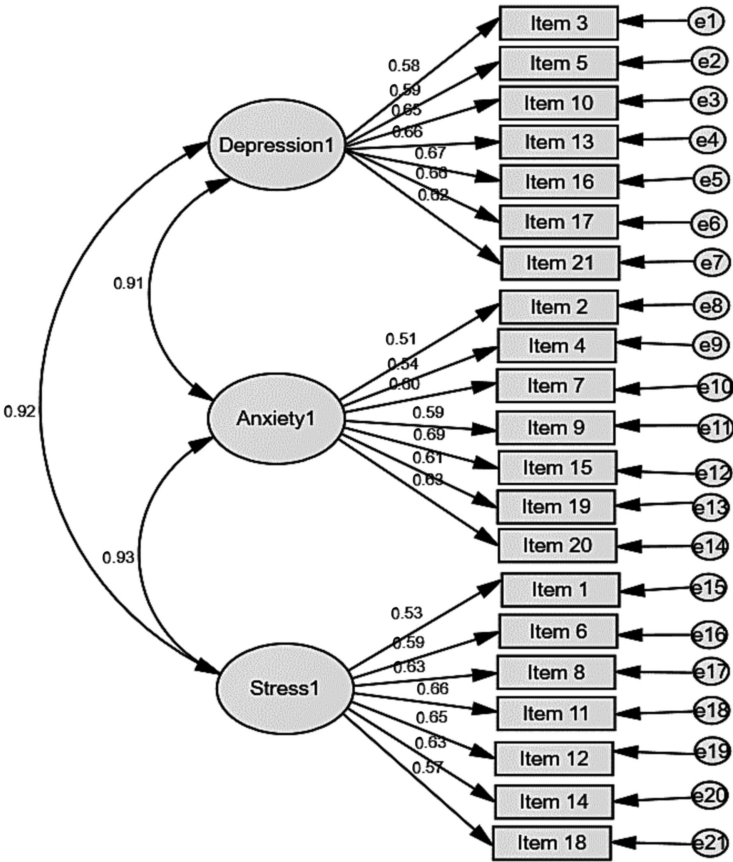

Figure 1.
CFA model for three factor model of DASS-21

Discussion

The discussion would first provide a brief overview of the main results of this study. Then, it will provide a comparison with previous research and discuss the differences with appropriate explanations and highlight the importance of these results with those who found similar results in previous studies. Next, the discussion will focus on presenting the similar results of DASS-21 scale, as one of the key objectives in this study was to validate the use of DASS-21 as a standardised psychometric tool for identifying psychological distress amongst university students. Finally, the limitations of the study are considered and the recommended interventions are presented for universities to adopt accordingly.

Overview of main results

The results from the current study indicated that levels of psychological distress related to depression and stress are at normal levels for this sample, whilst scores reported for anxiety indicated moderate levels of psychological distress amongst participants. Approximately, half of the participants were identified to have moderate levels of anxiety symptoms although this scale is only a screening tool for identifying and these results should not be taken at diagnostic levels. However, identification of psychological distress with a highly reliable screening tool as DASS-21 should be considered as good opportunities for implementation of prevention and promotion of better mental health and well-being amongst university students. The demographic analysis also gave a significant indication to identify the profile of a student in a similar sample that may need assistance with their mental well-being as M differences showed that being a young, unmarried and unemployed male was connected with higher levels of self-reported depression, anxiety and stress levels. These demographic results were also statistically significant across all three dimensions except for the employment status which only showed a significant difference with depression levels.

Amongst these students, there was a group of students who reported severe to extremely severe psychological distress although the number is proportionately small. It can be recommended that this group of students may need further attention from the universities and further studies should investigate the specific areas which they would need assistance so they would be able to maintain mental well-being and achieve academic success also.

Importance of current study

When comparing the results with previous research conducted at other universities in Sri Lanka (Kuruppuarachchi *et al.*, 2002; Liyanage, 2017), there were many researcher-developed tools that have been widely used but that was a limitation, as these were not psychometric tools that were validated to Sri Lankan context. Thus, these were deemed to lack validity of measurement that can affect implementation of interventions based on such results. However, from the standardised instruments that were designed to measure and evaluate mental health disorders, most scales measured them separately whilst DASS-21 is unique, as the three constructs are assessed by one single scale (Liu *et al.*, 2019; Talwar *et al.*, 2016). Moreover, this study has shown that DASS-21 is to be a suitable screening tool for use within tertiary educational settings as confirmed by previous research from other Asian countries also (Talwar *et al.*, 2016; Bruffaerts *et al.*, 2018; Chen *et al.*, 2013).

In comparison with psychological distress reported with the use of DASS scale in other countries, a web-based survey that utilised DASS-42 and collected data from nearly 80,000 students studying in their first year in Hong Kong universities showed moderate severity to higher levels of anxiety being most commonly reported (42%), whilst stress (27%) and depression (21%) were at lower levels compared to anxiety (Wong *et al.*, 2006).

The current study also showed results to confirm this trend as anxiety symptoms being the most common type of emotional distress to be reported by students in higher education

in Asian countries (Ajmal and Ahmed, 2019; Cheung *et al.*, 2020; Liu *et al.*, 2019). Since only pre-COVID-19 studies were compared with the results of this study, it was interesting to find that Ajmal and Ahmed's (2019) study found anxiety not only as a significant factor affecting students, but they showed that it also influenced the academic performance of students at an open university in Pakistan. In a longitudinal study using DASS-21 with Chinese undergraduates, they also concluded anxiety as a more significant issue that was reported beyond the normal levels by students (Liu *et al.*, 2019). Apart from investigating about the types of mental health issues, another aim of the present study was to investigate the reliability and underlying factor structure of the DASS-21 (Lovibond and Lovibond, 1995a).

DASS-21 and validation of psychometric properties

In detail, the study aimed to examine DASS-21 measurement invariance and the analyses that were conducted confirmed its original three factor structure with reliability statistics further confirming it. The internal consistency values of the three scales and total scores of the DASS-21 were consistent with those reported by several other studies (Lovibond and Lovibond, 1995a; Henry and Crawford, 2005; Liu *et al.*, 2019; Talwar *et al.*, 2016). On a methodological level, this study has taken a step towards analysing the data to confirm reliability and factor structure of DASS-21 for a university student population in an Asian country. This addresses the need raised by a previous study (Oei *et al.*, 2013), as they recommended using CFA to establish the factor structure within an Asian population. The results from the CFA for this study confirmed the original three-factor structure and the RMSEA levels suggested adequate model fit to the sample. Furthermore, together with the results from this study from an ODL institution in Sri Lanka, Pakistan (Ajmal and Ahmed, 2019) and from conventional universities in Sri Lanka (Kuruppuarachchi *et al.*, 2002; Liyanage, 2017) Spain (Ramón-Arbués *et al.*, 2020) and China (Liu *et al.*, 2019) has indicated psychological distress amongst students.

Hence, there is a growing need to increase awareness about what is mental health and well-being, how would it affects students and what strategies and skills are required to maintain mental health and well-being. They should be incorporated into the for health promotional programmes conducted for new students and, at least, once a year or on demand for existing registered students. Students at tertiary education setting can be under extreme distress due to the type of programme they study (e.g. medical and engineering) to the type of mode they engage in studies (e.g. distance learning) and because of the employed status and related family responsibilities. Whilst identification of psychological distress is important through a validated psychometric tool, there is also a growing need to identify the individual or group-based causes of distress through exploratory studies conducted in future.

Limitations

This study has several limitations. First, as this study was cross-sectional, the relationships found could not be interpreted as causal. Second, the response rate was less than 50% of those available for the study at these regional and study centres, and this was mainly due to the faculty specific timetable schedules as some students were not available due to study periods and examinations. Third, as the sample was a convenient sample of only thousand students from the total student population in the university, the results cannot be generalised into the whole sample until further data are collected from those who did not respond during first round of data collection and with targeted group-level recruitment of different individuals within the university. Fourth, it should be noted that the DASS-21 results can only be taken as an indication of the psychological distress related to depression, anxiety and stress and it is

not a screening tool for these mental health issues. Finally, since that data collection for this study was completed before the Corona Virus Disease-19 (COVID-19) pandemic, the results obtained were considered and interpreted with pre-COVID-19 context, as post-COVID 19 contexts had a profound impact on increasing levels of psychological distress across all societies in current world.

Implications for future research

The present study was able to verify the use of a validated psychometric tool to measure the level of depression, anxiety and stress amongst undergraduate students, and this filled the methodological gap that remained in this area of mental health research within university context. Since review of previous researchers showed that it was common to use researcher-developed tools to measure sensitive information such as mental health concepts, this study has paved the way for future researchers to use these types of validated tools with confidence and investigate further about specific causes of mental health issues, develop suitable interventions and promote mental health within university context. This study also emphasises the need to use such standard methods than using tools that lack the conceptual and dimensional incorporation into the measurement psychological constructs leading to a better understanding about these issues.

In addition, to the best of our knowledge, there has been little or lack of research published on psychological distress in relation to undergraduate students in Sri Lankan higher education system using validated psychometric questionnaires; amongst distance-learning universities, it is even more scarce. Although this was conducted within a university that adopts a distance study mode, it could be utilised by other universities in Sri Lanka and in Asian continent to assess student mental health status and take necessary action accordingly to widen the understanding about the topic of mental health as the first and foremost task. It is noted, however, that due to the nature of the open university's unique identity as a distance-learning institute with majority of students being in employment the results may be different from this study.

Recommendations for universities

For recommendations to the universities or institutions using ODL system, the first would be to provide an orientation period or a module where the students have an opportunity to assess (i.e. resources and skills) and gain required skills and prepare for distance education. This should include the opportunities for them to practice these skills (e.g. submitting online assignments and participating in online forums) before they start the subject-related courses of their programmes, as this can reduce anxiety related distress which was a main result of this study.

Second, as the research indicated anxiety and related thoughts as being reported with moderate to high levels similar to previous studies (Cheung *et al.*, 2020; Liu *et al.*, 2019; Wong *et al.*, 2006), it is important that universities gather information about resources and skills of new students at their registration and identify those with lack of resources to face the distance education system (e.g. physical resources and information technology skills). Third, by introducing students to the available psychological help such as free counselling services at the registration period would strengthen their resource availability from a mental health perspective. In relation to this, according to the recommendations from Liu *et al.*'s (2019) longitudinal study, it will be useful to have "tailored" psychological help corresponding to the relevant study year either by offering individual help or group-based programmes, as the challenges of year one maybe different from that of final year. Instructors and teachers at distance-education institutes can have yearly training including role play sessions and case

study sessions organised by staff development centres and counselling and/or well-being centres of universities.

Fourth, to develop routine and continuous health awareness programmes and open discussions on mental health and well-being due to the stigma and myths attached to seek help or access treatment to mental disorders. These can even be recommended to incorporate into the curriculum as appropriate or even introduce non-credit study modules on basic psychological topics such as mind–body–behaviour relationships and workshops that help students to increase their levels of resilience, problem-solving skills and relaxation techniques that would help them face academic and personal life challenges. Due to the current popularity with mobile applications, it has been suggested by previous studies that mobile health applications to be utilised for psychoeducation about mental health amongst students (Cheung *et al.*, 2020). If it were to be physical interactions, then these can be facilitated through student societies, faculty level seminars and integration of health and well-being information into orientation programmes or foundation-level courses so identification and prevention of mental health issues are being targeted at early stages of student life.

In conclusion, aim of the study was to validate the use of a psychometric scale to identify psychological distress levels of undergraduates at a university using the distance learning approach and this goal was achieved successfully. In future studies, specific issues and causes related to the obtained result of higher levels of anxiety-related psychological distress should be further explored as this might be a unique problem for the university students in distance-learning programmes.

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