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Validating the psychometric properties of the anxiety subscale of the DASS-21

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Abstract

Anxiety is a recognized negative activated emotion characterized by constant worry and uncertainty of a situation or outcome. Although worrying may be an everyday activity, excessive and frequent traits can impair academic functioning. The study thus aimed to validate the psychometric properties of the anxiety subscale of the DASS-21 among a non-clinical sample of visual art students and ascertain their existent level of anxiety. Using a cross-sectional survey design, a hundred and fifty visual arts students from KNUST senior high school, Ghana, completed a questionnaire containing the anxiety subscale of the DASS-21 and some demographic details. Analysis was done using JAMOVI. It was revealed that more than two-thirds of the sample fell within the ratings of moderate anxiety level to extremely severe anxiety. Besides, female visual arts students reportedly had a slightly higher anxiety level ($m=16.4$, $SD=9.07$) than their male counterparts ($m=12.7$, $SD=8.86$) using the mean figures of the total anxiety score. The anxiety subscale had commendable psychometric properties and its reliability and ease of administering will enhance the diagnoses and research on anxiety among senior high school students in Ghana.

Keywords: anxiety, DASS-21, gender, academic level, psychometric properties

Public Interest Statement

Emotions have long been noted to affect learning either positively or negatively given that they are either positive or negative (Goleman, 1995). Since anxiety is a negative emotion, it is no wonder that it wanes learning. However, this is an issue that may be easily glossed over in academia especially with large class sizes in senior high schools. The study look into this issue calls attention to teachers and other stakeholders in education to carefully consider the play of anxiety and other negative emotions in their classrooms.

Introduction

Emotions play an integral role in students learning, performance, and achievement. Anxiety is a prospective emotion that has been linked to learning and academic performance. According to Ajmal and Ahmad (2019), anxiety is a basic human emotion built on fear, apprehension and uncertainty, which may project and affect an individual's self-esteem. From the admission into various levels of academia, relationships with peers, studying and examination (Ajmal & Ahmad, 2019), incessant worry of meeting academic targets, among others, students experience and or become anxious in several areas.

One of the supportive theories linking anxiety and education is the control value theory of achievement by Pekrun and Perry (2014). The theory postulates that emotions exist in the educational setting, otherwise known as the achievement emotions (anger, anxiety, depression, enthusiasm). The control value theory pushes forward the idea that a student's learning, emotions and performance are linked by reciprocal causation ((Pekrun & Perry, 2014; Pekrun, 2006).

The survey of the available literature suggests an existent gap regarding studies done on anxiety in education in Ghana. However, existent in the few studies identified is the instrument anxiety scales such as Beck Anxiety Inventory (BAI), State-Trait Anxiety Inventory and the DASS-21, and population and sample, which is predominantly undergraduates and graduate students. A study by Krafona (2014), which used the BAI among a sample of 133 undergraduate psychology students aged 21 to 34 years, reported the mean scores for the males to be slightly higher than the females. However, there was no significant difference between males and females when an independent test was performed. The study also further reported an excellent Cronbach alpha coefficient of $\alpha = 0.93$. Kugbey et al., (2015) reported similar findings in a study conducted using a sample of 165 University of Ghana students with a mean age of 22.98 years and a standard deviation of 3.19 years. Their study, using the DASS-21, reported findings that male students experienced statistically significant anxiety [$t(163) = 2.20, p < .05$] than female students. The anxiety subscale in their study reported an acceptable Cronbach alpha coefficient of $\alpha = 0.79$. Contrary to these findings are studies by Schukajlow (2019) and Chapell et al., (2005), which reported a relatively higher level of anxiety for female students than for male students.

Evident from the available literature on studies conducted in Ghana using the anxiety subscale of the DASS concerning anxiety and education is that it is practically nonexistent. Also, validation of the psychometric properties of DASS-21 in a Ghanaian construct has not been done. The scale has been reliable and useful in clinical and non-clinical populations, with at least three validation studies (Vignola & Tucci, 2014; Tonsing, 2014; Henry & Crawford, 2005).

The conceptual basis of the Depression, Anxiety, and Stress Scale (DASS) was on the tripartite model of anxiety and depression. This model proposes that the disorder of affect (and its subtypes) is a continuum between depression, anxiety and stress. While depression is characterized by low positive affect, hopelessness, low self-esteem and low encouragement, anxiety is related to symptoms of physical arousal, panic attacks, fear, irritability and frustration (Singh, Prabhuappa, Egbal& Singh, 2013). Stress on the other hand is characterized by tension, irritability, alertness, resistance, exhaustion and a tendency to overact to stressful events (Vignola & Tucci, 2014; Singh, Prabhuappa, Egbal& Singh, 2013).

The Depression, Anxiety, and Stress Scale (DASS) is a self-report scale designed to measure the negative emotional states and traits. The shortened version of DASS is a 21-item scale comprising three subscales Depression, Anxiety and Stress. Each subscale has a total of seven (7) items. The full scores of the scale is obtained by multiplying the total scores by two as it is a shortened form of the DASS-42, which has fourteen (14) items per subscale. The anxiety subscale of the DASS-21 measures situational anxiety,

subjective experience of anxious effect, skeletal muscle effects and autonomous arousal.

The purpose of this study was to validate the psychometric properties of the anxiety subscale of the DASS-21 in a Ghanaian construct, to identify the prevalent level of anxiety amongst a non-clinical sample of visual arts students and to identify if there is a difference in anxiety with respect to gender and academic level.

Materials and Method

Design and setting

The study is a cross-sectional survey design aimed at validating the anxiety subscale of the DASS-21 amongst visual arts students. The study was conducted at KNUST Senior High School, Kumasi, Ghana.

Respondents

The sample for this study was visual arts students in their second and third years at Knust Senior High School. A purposive sample of a hundred and fifty (150) visual arts students from KNUST senior high school, Ghana, completed a printed questionnaire containing the anxiety subscale of the DASS-21 and demographic details on age, gender, and academic level. Responses were measured on a 4-point Likert scale. The respondents were informed about the study’s objective and were assured confidentiality.

Measures

The respondents were required to complete a printed questionnaire of the DASS-21 and two demographic questions on gender and age.

Instrument

The anxiety subscale of the DASS-21 was adopted for the study. The subscale has a total of seven (7) items scored on a four-point Likert scale ranging from 0(never) to 3(almost always). Some of the items are “I was aware of dryness of my mouth” and “I experienced trembling”. The full score of the anxiety subscale is obtained by summing the scores of the items and then doubled. Table 1 shows the severity rating of the anxiety subscale of the DASS-21 and their cut off values as given by Lovibond and Lovibond (2004)

TABLE 1					
DASS RATING					
	Normal	Mild	Moderate	Severe	Extremely severe
ANXIETY	0-7	8-9	10-14	15-19	≥20

To validate the anxiety subscale of the DASS-21, previously validated instruments, the Beck Anxiety Inventory (BAI) was used. The BAI, designed by Beck at al. (1988), is a self-report questionnaire that measures the severity of anxiety in adults and adolescents. It contains 21-item with responses measured on a 4-point Likert scale ranging from 0(not at all) to 3(severely). The final result is obtained by summing the values of individual items.

Statistical analysis

The statistical tool JAMOVI version 1.8.0 was used to analyze the data collected from the respondents. Descriptive analysis (mean and standard deviation) was calculated for the total scores of the anxiety subscale of the DASS-21. A T-test was done to identify if there were differences in anxiety levels, academic levels and gender.

The reliabilities of the measured scale were estimated using Cronbach alpha. The Pearson correlation test (r) was used to determine the correlation between the Anxiety subscale of the DASS-21 and the Beck Anxiety Inventory (BAI) with a confidence level of 95% and a $p < 0.05$.

Confirmatory factor analysis was performed. The evaluation and adjustment of the model were

assessed by using the fit indices, comparative fit index(CFI), TLI, Standardized root mean squared residual (SRMR), Robust root mean squared error of approximation(RMSEA), Chi-squared statistics(X^2).

Results

A total of 150 respondents aged 15-22 years (mean=17.8years, standard deviation=1.29 years) participated in the study. The total sample was made of twenty-four (24) Form 3 female and fifty-four (54) Form 3 male visual arts students, eighteen (18) Form 2 female and fifty-four (54) Form 2 male visual arts students. In sum, there were seventy-eight (78) Form 3 and seventy-two (72) Form 2 visual arts students. Table 2 shows the sociodemographic description of the total sample, while Table 4 shows the total mean scores split by gender and split by academic level.

Table 2 Sociodemographic profiles of the 150 respondents

VARIABLES		M	SD	FREQUENCY (%)
Gender	Male			108 (72.5)
	female			42 (27.5)
Age		17.8	1.29	
Academic level	Form 3			78 (52.0)
	Form 2			72 (48.0)

Table 3 Total mean scores between Gender and Academic level

		Mean	Standard deviation
Academic level	Form 3	16.1	9.40
	Form 2	11.2	7.92
Gender	Female	16.4	9.07
	Male	12.7	8.86

Table 4 Total mean scores split between Gender and Academic level

	Gender	Academic level	Total anxiety mean scores
Mean	Female	Form 3	17.6
		Form 2	14.8
	Male	Form 3	15.5
		Form 2	9.96
Standard deviation	Female	Form 3	9.16
		Form 2	8.95
	Male	Form 3	9.52
		Form 2	7.24

Differences between gender, academic levels and severity of anxiety levels

Table 5 portrays the differences in severity of anxiety levels experienced between gender and academic levels. There were thirty nine (26.0%) normal, fifteen (10.0%) mild, thirty four (22.7%) moderate, eighteen (12.0%) and forty-four (29.3%) extremely severe ratings.

Table 5 Severity of anxiety levels between gender and academic level

Rating levels of anxiety	Academic level	Gender	
		Female	Male
Normal	Form 3	3	13

Table 5 Severity of anxiety levels between gender and academic level

Rating levels of anxiety	Academic level	Gender	
		Female	Male
Mild	Form 2	4	19
	Form 3	2	2
	Form 2	2	9
Moderate	Form 3	6	9
	Form 2	5	14
	Form 3	1	9
Severe	Form 2	1	7
	Form 3	12	21
Extremely severe	Form 2	6	5

Reliability and concurrent validity

To assess the internal consistency of the anxiety subscale of the DASS-21, the Cronbach alpha was computed with a figure $\alpha=0.750$. A CFA of the subscale was performed to determine its specific construct validity. In Table 6 are the summarized results of the CFA performed to examine the factorial structure underlying the anxiety subscale of the DASS-21.

Table 6 Summary of fit indices from CFA

	X^2	DF	p	CFI	TLI	SRMR	RMSEA	RMSEA 90% CI	
								lower	upper
Model	22.2	14	0.075	0.955	0.932	0.0475	0.623	0.00	0.109

To examine the concurrent validity of the anxiety subscale of the DASS-21, correlation with other measures of anxiety (BAI) was computed using the Pearson correlation test (r) at a confidence level of 95% and $p < 0.05$. The correlation between the Anxiety subscale and the Beck Anxiety Inventory reported a confidence level of 95%, $r= 0.491$ and a $p < 0.01$.

Discussion

The present study was conducted using a non-clinical sample to validate the anxiety subscale of the DASS-21. To the best of our knowledge, this is the first study to validate the anxiety subscale and even the DASS-21 in a Ghanaian construct using the confirmatory factor approach.

According to the total mean scores obtained and split between gender, albeit the extreme difference in the representation of numbers between the genders; females (27.5), males (72.5), females have a much higher mean anxiety score than their male counterparts (Females $m= 16.4$, $SD= 9.07$; Males $m=12.7$, $SD= 8.86$). This finding supported the idea of gender difference in experience and reporting of anxiety as reported in studies by Schukajlow (2019) and Chapell et al., (2005), which reported a relatively higher level of anxiety for females than male students. However, the difference in anxiety experienced between male and female contradicted the findings of Kugbey et al., (2015), depicting male students experienced statistically significant anxiety [$t(163) = 2.20$, $p < .05$].

There was also a significant difference in terms of academic level and anxiety. Findings from the study depict a significant difference in mean anxiety scores obtained by the two academic levels. Respondents in Form 3 appeared to have a higher mean anxiety score ($m=16.1$, $SD= 9.40$) than respondents in Form 2 ($m=11.2$, $SD=7.92$). As the form 3 in Senior High school is the final year, this significant difference in anxiety level with respect to academic level was supported by Kugbey et al., (2015), who attributed this significance to the pressures of having to meet academic targets as well dealing with issues related to advancement in education.

According to the severity rating levels of anxiety in Table 5, there were thirty-nine (26.0%) normal, fifteen(10.0%) mild, thirty-four (22.7%) moderate, eighteen (12.0%) severe and forty-four (29.3%) extremely severe ratings. This distribution placed sixty-four percent (64%) of the total sample in moderate

and extremely severe anxiety. This finding concurred with the findings of Kugbey et al., (2015) that there is a slightly high prevalence of anxiety amongst students, which could negatively impact their academic performance.

A confirmatory factor analysis of the anxiety subscale performed to determine its specific construct validity depicted that the one-factor model presented has an excellent fit to the data; Anxiety ($X^2= 22.2$, $df= 14$, $p =0.075$, $CFI =0.955$, $TLI= 0.932$, $SRMR= 0.0475$, $RMSEA= 0.0623$).

The reliability of the anxiety subscale of the DASS-21 was estimated using the Cronbach alpha and reported a Cronbach alpha $a = 0.750$. This is contradictory to the Cronbach alpha coefficient of other studies presented in the literature; Cronbach alpha $a=0.82$ by Henry and Crawford (2005), a Cronbach alpha $a=0.86$ for the anxiety subscale by Vignola and Tucci (2014) and a Cronbach alpha of $a= 0.79$ by Kugbey et al., (2015). However, according to the rating scale of instrument quality criteria, the Cronbach alpha coefficient $a = 0.750$ is considered acceptable and reliable (De Vellis, 2012; Pua, Lee & Lai, 2019).

The reliability of the Beck Anxiety Inventory was estimated using the Cronbach alpha and reported a Cronbach alpha $a = 0.905$, which is consistent with the findings of Krafona (2014). The Pearson correlation test (r) used to determine the correlation between the anxiety subscale and the BAI reported a moderate correlation ($r= 0.491$, $p< 0.01$).

Conclusion

There appear to be a slightly high prevailing level of anxiety (64%) present amongst the total sample of Visual Art students from the rating of severity ranging from moderate to extremely severe. There also seem to be a correlation between anxiety, gender and academic level, confirming and contrasting with previous studies on the anxiety level experienced and reporting between females and males. The study concluded that although females only make up 28.0% of the total sample, their anxiety mean scores (Females $m= 16.4$, $SD= 9.07$) are higher than males who make up 72.0%. The fit indices; Anxiety ($X^2= 22.2$, $df= 14$, $p =0.075$, $CFI =0.955$, $TLI= 0.932$, $SRMR= 0.0475$, $RMSEA= 0.0623$) and Cronbach alpha coefficient $a= 0.750$ performed for the reliability and concurrent validity of the anxiety subscale indicated that Anxiety subscale of the Dass-21 could be potentially helpful in the Ghanaian construct for studies on anxiety in education. This provides a foundation for further studies for art educators and researchers to consider the relation between anxiety and the various facets of visual arts.

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Conflicts of Interest: The authors declare no conflict of interest.

Disclaimer Statement

This work is part of a thesis submitted to the Kwame Nkrumah University for the award of an MPhil Art Education degree in the department of Educational Innovations in Science and Technology.

Author Bionote

Ama Amponsah Dwamena is a visual arts teacher in Ghana. She has held an interest in developing her students' artistic skills, especially in drawing ability, across the disciplines offered under the visual arts. After six years of teaching at the senior high school level, she hightailed into higher education. She completed her MPhil in Art Education with interest in building and developing artistic abilities, especially in drawing. She is currently undertaking her PhD in Art Education at KNUST with a continued interest in researching entanglements of the school, the development and building of skills in the visual arts and creativity.

Mavis Osei is a senior lecturer with over fourteen years of teaching experience at the Kwame Nkrumah University of Science and Technology where she received her PhD in Art Education and BA Art. She also has an MA in Art Therapy from the Long Island University, New York through a Fulbright scholarship and a Diploma in Mental Health Studies. Her research interest spans across Art therapy and SDG 3 especially emotional and mental wellbeing, Self-concept/ Emotional Personality and their link with education, integration of art in other fields to enhance teaching/learning, and the therapeutic use of art among others.

Authorship and Level of Contribution

Ama Amponsah Dwamena worked on conceptualizing the manuscript, the methodology through to the writeup whereas Mavis Osei refined the conceptualization of the manuscript and edited the write-up in a 65% to 35% of work done respectively.

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