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AI COUNSELLING TECHNIQUE: ENHANCING STRESS MANAGEMENT AMONG ENGINEERING STUDENTS WITH PHYSICAL DISABILITY

Augusta Nkem MOLOKWU
PhD, Federal college of education special Oyo, Oyo state, Nigeria
ORCID: https://orcid.org/0000-0002-1058-6602
augustamolokwu@gmail.com

Micheal MOLOKWU
Naval Institute of technology, Sapele, Nigeria
ORCID: https://orcid.org/0009-0008-6561-8879
michaelmolokwu2024@gmail.com

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Abstract

Engineering studies can negatively impact the academic performance and mental health of those with physical disabilities. The impact of Artificial intelligence (AI) counselling technique on stress management of engineering students with physical disability was explored. There's a dearth of research relating to AI counselling technique and students with physical disabilities. The pretest posttest control group quasi-experimental research design was adopted. Six hypotheses guided the study. Participants were 98 physically challenged engineering students selected across ten institutions of higher learning in Nigeria. Experimental groups and the Control group were all pretested using self-designed Perceived Stress Level Scale (PSLS). The experimental group was treated with AI-enhanced counselling for 5 weeks while the control group was exposed to conventional counselling. Then subjected to PSLS. Percentage, mean, standard deviation and analysis of covariance (ANCOVA) were used. Findings were a significant main effect of AI counseling technique on stress management (F-ratio $_{(1, 97)}$ = 7.235), a significant main effect of level of study on stress management (F-ratio $_{(2, 98)}$ = 4.409). A significant interaction effect of level of student and AI counseling technique on the stress management (F-ratio $_{(2, 96)}$=5.352) no significant interaction effect of gender, level of study and AI counseling technique was found (F-ratio $_{(3, 95)}$ =1.274). Incorporating AI counseling technique for managing stress was recommended.

Keywords: AI counseling, stress management, engineering students, physical disability.

INTRODUCTION

In today's fast-paced world, stress is a pervasive issue affecting people from all walks of life. Srivastava, Saxena, & Baijal, (2024) opined that young job seekers have a fair share of the stress syndrome as they often face considerable stress and insecurity in the course of their progression from training to employment. As Gyasi and Yeboah (2020) put it, stress has become part and parcel of African campuses. Persons with physical disabilities every so often face distinct stressors, such as ease of access, mobility, and discrimination-related challenges (Gyasi & Yeboah, 2020). For students with physical disabilities, the stress may be higher and can negatively impact their academic performance, well-being, and mental health. Suffice to say that they face many challenges in academics, social life which ultimately becomes evident in their self-image. With the increasing use of technology, AI-based counseling techniques have emerged as an auspicious tool for learning and gathering information.

Artificial intelligence (AI) has been beneficial for learning, gathering information, and research purposes (Dwivedi, Hughes, Ismagilova, Aarts, Coombs, Crick & Williams, 2021), nonetheless, there is a knowledge gap on its impact regarding counseling of engineering students with physical disability. Despite the fact that counseling programme and service may possibly be obtainable for students in higher institution of learning, the provision may not meet the unique requirement of physically challenged students. As these students face a number of challenges and obstacles beyond ordinary accessibility related to curriculum, instruction and assessment (Clavijo-Castillo & Bautista-Cerro, 2020). As a result, challenges related to adjustments and regulation, which affect their identity development force them to develop self-advocacy skills.

AI counseling tools offer potential benefits, such as constant availability, accessibility, and anonymity, which could be on the whole valuable for students with disabilities. The use of AI among students may differ across gender though (Pasquarella & Daley, 2021; Tabassum & Nayak, 2021). Male students may exhibit courage bearing academic stress while female students may share their burdens during counseling (Naznin & Nayak, 2021). Their educational level and socio-economic status also determine how they respond to AI counseling. Students who have spent considerable number of years on their studies may have developed personal coping strategies, thus limiting the benefit they derive from AI counseling. Therefore, this study aims to investigate the impact of an AI counseling technique on stress management among engineering students with physical disabilities with gender and level of study as moderating variables.

Literature Review

Artificial Intelligence Counseling

Looking into the prospective advantages of AI-driven technology, it is an irrefutable fact that AI is being used far and wide in educational sector as well as organizations. Artificial Intelligence (AI) is a rapidly growing field that has been incorporated into various fields and activities (Dwived, et al., 2021). It executes multifaceted tasks demanding human-like intelligence, such as language processing, recognizing patterns, and making decisions. For instance, currently, AI is used for medical diagnosis and ascertaining management options of diseases and treatment (Davies, Eynon & Salveson, 2020), thus, helping doctors make informed decisions (Frye, 2020), analyze data and make predictions on market trends, (Gordijn, & Have, 2023), to improve fraud detection and prevent financial crimes (Hao, 2019; Odeyemi, Awonuga, Mhlongo, Ndubuisi, Olatoye & Daraojimba, 2024), furthermore to analyze data and personalize marketing efforts (Elsen-Rooney, 2023) and finally, for educational purposes such as personalize learning experiences for students (Davies et al., 2020). AI counselling involves the use of ChatGPT to search for supports required for stress, and anxiety.

The GPT acronym is derived from ChatGPT language model called Generative Pre-Trained Transformer invented by Open AI. The AI can produce response text that is virtually indistinguishable from known human language (Frye, 2022). It is safe to describe ChatGPT as a highly developed Chabot that can handle a diversity of text-based demands, as well as simple question-answering and more difficult ones bordering on writing intricate piece and enabling people to maneuver tough situations (Liu, Zheng, Du, Ding, Qian, Yang & Tang, 2021). In summary, Artificial intelligence (AI) therapy is for all intents and purposes is a multipart and comprehensive use of data to support persons on the path of mental wellness (Arger, 2023).

Students with Disability in Higher Institutions

Physical disabilities include any physical or medical condition that significantly impacts daily life. These include, but are not limited to, conditions such as visual or hearing impairments, mobility constraints, and seizure disorders (Tahir, Thambapillay, Yusoff, & Rahman, 2020). In this study, physical disabilities are defined as those that first and foremost primarily impact the body. People with physical disabilities face a variety of challenges and obstacles in performing everyday activities, isolation, independence, educational

and career achievement (Aamlid & Brownfield, 2019; Gaskin, Imms, Dagley, Msall, & Reddihough, 2021; Kotera, Chircop, & Hutchinson, 2021; Salt & Jahoda, 2020). Nagar, Quirk, & Anderson (2023) explored the experiences college students using mental health applications undergo in order to advance self-care skills. Students of higher institutions of learning impacted by physical disability are limited in multiple ways. They are mandated to put into consideration physical accessibility over other dynamics like academics and finances when choosing a school, and often times, express significant loneliness (Kotera et al., 2021).

Stress

Many students in the course of attending classes, doing assignments and making presentations experience one form of stress or the other. As a consequence, Obi (2020) opines that stress is a wide-reaching involvement in the lives of a lot of persons. In the same vein, Odita (2023) theorized that stress is inescapable in school environment. Even among employers and employees, stress has become a familiar occurrence. Making an allowance for stress, allows for positive acceptance that leads to greater productivity and enhanced performance, while, deleterious stress leads to various complications. Agreeing with Gibbons (2021), school pressures and stress may impede academic performance nonetheless.

Stress management technique is a set of strategies and programmes aimed to support individuals in handling stress by way of isolating stressors and decreasing their impact (Brown, 2021). It's a "wide-ranging range of procedures and psychotherapies concentrated at regulating stress, ordinarily to improve daily routine. (Odita, 2023). Stress management involves components/mechanisms that must be used appropriately to subsist excellently at school.

Statement of the Problem

Engineering studies are known for being challenging and demanding for all students. Engineering students with physical disabilities experience high levels of stress. This is capable of creating negative impact on their academic achievement, performance, well-being, and mental health. Obtainable stress management resources may possibly not be amply tailored to make available support to individual challenges encountered by this population. Artificial intelligence (AI) has been used for learning, gathering information, and research purposes but its impact on counseling of engineering students with physical disability is not yet known. While counseling programme and service may be within reach for students in higher institution of learning, the service may not meet the unique need of physically challenged students.

These students face several challenges and obstacles beyond mere accessibility related to the curriculum, instruction style, and assessment. Consequently, they encounter challenges related to adjustments and regulation, which affect their identity development, forcing them to develop self-advocacy skills, sometimes resigning to fate and defeat. Decreased self- esteem, self- confidence and self-concept. Regardless of the growing interest in utilization of AI, there is limited research on their effectiveness in supporting individuals with physical disabilities. There is a need therefore, to explore the potential impact of AI counseling techniques to support stress management among engineering students with physical disability.

Hypotheses

The following hypotheses guided the study:

1. There is no significant main effect of treatment on stress management of engineering students with physical disability.
2. There is no significant main effect of gender on stress management of engineering students with physical disability.
3. There is no significant main effect of level of study on stress management of engineering students with physical disability.

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4. There is no significant interaction effect of gender and treatment on stress management of engineering students with physical disability.
5. There is no significant interaction effect of level of study and treatment on stress management of engineering students with physical disability.
6. There is no significant interaction effect of gender, level of study and treatment on stress management of engineering students with physical disability.

METHOD

The pretest posttest control group quasi-experimental research design was adopted for the study. Six hypotheses guided the study. Random sampling technique was used to select 98 physically challenged engineering students across ten institutions of higher learning in Nigeria. There were two groups: Experimental groups and the Control group which were all pretested using Perceived Stress Level Scale (PSLS) designed by the researcher. The scale was used to assess the stress level before being exposed to the treatment. The experimental group was later treated with AI counseling technique which is ChatGPT oriented for 5 weeks while the control group were exposed to conventional counselling. The two groups were subjected to PSLS to ascertain their stress level again. Data collected were analyzed using percentage, mean, standard deviation and analysis of covariance (ANCOVA).

RESULTS

Demographic characteristics of the participants included in the study according to gender and education level are given in Table 1.

Table 1. Socio-demographic data.

Variable	N	%	Mean	SD
Gender				
Male	42	42.9		
Female	56	57.1	1.57	.497
Total	98	100.0		
Study level				
100-200	56	57.1		
300-500	42	42.9	1.43	.497
Total	98	100.0		

Table 1 shows the demographic characteristics of the participants across gender and level of study. It shows that female engineering students represents 57.1% of the participants while 42.9% represented male engineering students with mean and standard deviation of 1.57 and .497 respectively. The table also shows that engineering students from 100-200 level of study accounted for 57.1% of the participants while those in 300-500 level of study accounted for 42.9% with mean and standard deviation of 1.43 and .497 respectively. The table therefore reveal an even spread of the participants across gender and level of study.

Table 2 is ANCOVA showing the main effect and interaction effect of the moderating variable and AI counseling on the management of stress among the participants at p<.003 <.005. The table shows that at df of 1, 97, and F-ratio=7.235 which shows that there is significant main effect of treatment on stress management of the participants. The partial eta is.033 and this implies that stress management of the participants is determined by 33% of the treatment. Therefore, Hypothesis 1 is rejected.

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Table 2. Analysis of covariance (ANCOVA) showing main effect of gender; study level and ai-counseling; interaction effect of AI-counseling and gender; interaction effect of AI-counseling and study level; and interaction effect of gender, study level and AI-counseling.

Dependent Variable: Stress management

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	902.906[a]	11	100.322	1.216	.302	.086
Intercept	95986.008	1	95986.008	905.122	.000	.910
Pretest	4.433	1	4.433	1.231	.347	.001
gender	32.013	2	26.006	.100	.703	.002
Study level	43.368	2	21.684	4.409	.004	.035
Treatment	24.923	1	24.923	7.235	.003	.033
Gender * Treatment	157.929	1	157.929	1.489	.226	.016
Study level * Treatment	567.579	1	567.579	5.352	.003	.056
Gender * Study level * Treatment	135.106	1	135.106	1.274	.262	.014
Error	9544.288	87	110.980			
Total	125853.000	98				
Corrected Total	106495.647	97				

The Table 2 also shows that at df of 2, 96, and F-ratio = .100 which shows there is no significant main effect of gender on stress management of the participants at p< .753 > .005. The partial eta is .001 and this implies that stress management of the participants is predicted by 1% of gender. Therefore, there is no significant main effect of gender on stress management of the participants. Hypothesis 2 is therefore accepted.

The table also shows that at df of 2, 96, and F-ratio = 4.409 which shows there is significant main effect of study level on stress management of the participants at p< .004 < .005. The partial eta is .035 and this implies that stress management of the participants is predicted by 35% of study level. Therefore, there is significant main effect of study level on stress management of the participants. Hypothesis 3 is therefore rejected.

The Table 2 also shows that at df of 2, 96, and F-ratio =1.489 which shows there is no significant interaction effect of gender and treatment on stress management of the participants at p<.226>.005. The partial eta is .016 and this implies that stress management of the participants is predicted by 16% of gender and treatment. Therefore, there is no significant interaction effect of gender and treatment on stress management of the participants. Hypothesis 4 is therefore accepted.

The table also shows that at df of 2, 96, and F-ratio=5.352 which shows there is significant interaction effect of study level and treatment on stress management of the participants at p<.003< .005. The partial eta is .056 and this implies that stress management of the participants is predicted by 56% study level and treatment. Therefore, there is significant interaction effect of study level and treatment on stress management of the participants. Hypothesis 5 is therefore rejected.

The table also shows that at df of 2, 96, and F-ratio=1.274 which shows there is no significant interaction effect of gender, study level and treatment on stress management of the participants at p<.262 >.005. The partial eta is .014 and this implies that stress management of the participants is predicted by 14% study level and treatment. Therefore, there is significant interaction effect of gender, study level and treatment on stress management of the participants. Hypothesis 6 is therefore rejected.

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DISCUSSION, CONCLUSION, and SUGGESTIONS

It was found that AI counseling has significant main effect on stress management of physically challenged engineering students. This finding is similar to Khawaja and Bélisle-Pipon (2023) who investigated if AI could have a positive effect in increasing access to mental health care and found that an AI as a psychotherapy tool could help with diagnoses via comprehensive data access and analyzing behavioral patterns, and that chatbot could mimic practitioner questions and subsequently make recommendations based on a user's input. Silva (2022) also reported that the use of AI could significantly positively enhance psychotherapy and reduce clinical mental health symptoms and AI counseling therapy was met with high satisfaction, engagement and retention rates. Bouhouita-Guermech, Gogognon and Bélisle-Pipon (2023) explored the challenges posed by AI just as Brisson, Bélisle-Pipon and Ravitsky (2023), examined the influence that AI wielded over health of adolescents.

These earlier studies are in tandem with the submissions that AI counseling enhances the mental health and boost stress coping mechanism of persons with special needs. Khare, Khare and Chandra (2021) also had before then submitted that AI-powered counseling interventions positively impacted the mental health and stress management of engineering students. The study involved physically challenged students, and the results showed that AI-powered counseling was effective in reducing stress levels and improving overall mental health. It was found that gender it was also found that there is no significant main effect of gender on stress management of physically challenged engineering students but the main effect of study level is significant. This findings agrees with Singh, Singh, Sharma and Prasad (2021) who also found that gender did not significantly impact stress levels of engineering students, but study level did have a significant effect.

The researchers found that the interaction effect of study level and AI counseling on stress management of physically challenged engineering students was significant. These findings align with Silva (2022) in suggesting that AI counseling, as an alternative approach, can be effective for students at specific points in their academic journey. Srivastava, Saxena, & Baijal (2024) in their study, addressed the persistent concern bothering on mental health and total well-being of youth, in search of carreer search. Their findings support the submission that they often face considerable stress and insecurity in the course of their progression from training to employment.

No significant interactive effect of gender and AI counseling was found. This finding correspond with Singh, Singh, Sharma and Prasad (2021) who reported no significant interaction effect of gender and AI counseling, noting that works for male and female individuals.

The interaction effect of gender, study level and AI counseling was not significant. The study of Singh, Singh, Sharma and Prasad (2021) supports this finding.

Conclusions

Arising from the findings of the study, it is save to conclude that AI counseling is effective in managing stress of physically challenged engineering students across gender. It however needs to be tailored towards the needs of different level of study of the students for optional results. Based on the results of the analysis, the following conclusions were drawn:

The use of AI counseling is an effective tool to manage stress among physically challenged engineering students. Therefore, educational institutions should consider incorporating AI counseling services to support the mental health of their male and female students.

Study level has a significant impact on stress management among physically challenged engineering students. Therefore, educational institutions should consider providing different levels of support for students at different stages of their academic journey.

There is a significant interaction effect between study level and AI counseling on stress management. Educational institutions should consider providing targeted support for students at different stages of their academic journey to maximize the benefits of AI counseling services.

Each of AI counseling and study level has impact on stress management for physically challenged engineering students. Study level and AI counseling will have more potent impact on stress management of the physically challenged engineering students. No significant main effect of gender and AI counseling on stress management for physically challenged engineering students was found. No significant interaction effect of gender, study and AI counseling on stress management for physically challenged engineering students was found.

Recommendations

Based on the results of the analysis, the following recommendations can be made:

1. Incorporating AI counseling techniques can be an effective way to manage stress among engineering students. Therefore, educational institutions should consider implementing AI counseling services to support student mental health as it is effective and accessible to students.
2. Since the level of study was found to have a significant main effect on stress management, educational institutions should provide stress management resources and support to physically challenged engineering students at all levels of study.
3. There is no significant main effect of gender on stress management. However, it is important to take into account the unique needs of male and female students when designing stress management programme for physically challenged engineering students.
4. The significant interaction effect of the level of student and AI counseling technique on stress management for physically challenged engineering students indicates that certain AI counseling techniques is more effective for students at different levels of study. Therefore, educational institutions need to consider tailoring their AI counseling services to meet the specific needs of physically challenged engineering students at each level of study.

Ethics and Conflict of Interest

The authors declare that the work is written with due consideration of ethical standards. The authors declare that they have no competing interests.

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