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Assessment of Assistive Technology Utilization for Saudi Students with Physical Disabilities: A Comparative Study

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Abstract

This study examines the use of assistive technology (AT) among Saudi students with physical impairments, to address the lack of research in the educational setting of Saudi Arabia. The study used a comparative research design to investigate the current state of AT utilization, perceptions of efficacy, and variables that influence uptake. The method of stratified random sampling was employed to choose participants, and a structured survey instrument underwent thorough validation. Descriptive statistics, ANOVA, correlation, and regression analysis were employed to evaluate the information. The results indicate a generally positive perception of AT usage, with no significant differences in efficacy seen across mobility aids, communication devices, and adaptable software. Professional development has been identified as a significant predictor, highlighting the need for continuous teacher training. Infrastructure and legislation have significantly contributed to the increased usage of Assistive Technology. The examination provides unique perspectives to the global discussion on inclusive education and emphasizes practical recommendations for educators, policymakers, and academics in Saudi Arabia.

Keywords: Assistive Technology, Inclusive Education, Saudi Arabia.

Introduction

The worldwide discourse on inclusive education has intensified, underscoring the importance of ensuring equitable access to education for all individuals, irrespective of their physical capabilities. Recent research has emphasized the vital importance of assistive technology in fostering an inclusive educational setting (Bouck, 2018; Erickson & Lee, 2020). Assistive technology encompasses a diverse array of tools and gadgets that improve the educational experiences of persons with impairments, empowering them to engage more actively in academic pursuits (Bausch & Hasselbring, 2018). Saudi Arabia has been at the forefront of educational changes, to create a contemporary, inclusive, and technologically sophisticated learning environment (Al Lily et al., 2017).

The Kingdom has shown a commitment to integrating assistive technology into its academic framework, recognizing the importance of fulfilling the different requirements of its students (Alqahtani & Abdullah, 2021; Al-Senaidi et al., 2019). Although there is a clear lack of information in the current literature, regarding the actual application and efficacy of assistive technology for physically disabled students in the Saudi context, the efforts made in this area are commendable. While there have been global studies investigating the impact of assistive technology on college students with disabilities (Burgstahler, 2015; Higgins & Raskind, 2020), there is a dearth of research explicitly addressing this issue in Saudi Arabia.

The objective of this study is to fill this void by performing a comprehensive assessment of the utilization of assistive technology among college students in Saudi Arabia who experience physical disability. The objective of this study is to analyze the existing deployment of assistive technology in the educational landscape of the Kingdom to give significant insights that can guide policy, practice, and future research.

A crucial element of this work is the utilization of a comparative methodology. The study aims to investigate the effectiveness of various assistive technologies in supporting college students with physical impairments, considering

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the diverse array of available alternatives. The comparative assessment is essential for determining which technology better corresponds to the unique requirements of Saudi college students, allowing educators and policymakers to make well-informed choices on the selection and integration of assistive technology.

Acquiring a profound comprehension of the determinants that impact the adoption of assistive technology is essential for effectively integrating it into educational settings. Multiple research has investigated these aspects on a worldwide level (Tamim et al., 2011; Zorfass & MacArthur, 2019). Nonetheless, the distinct Saudi environment offers a captivating range of cultural, educational, and logistical factors that might influence the use of assistive technology. An examination of these elements would significantly augment our comprehension of the intricate difficulties and promising prospects associated with the use of assistive technology in schools in Saudi Arabia (Alharbi, 2020; Al-Harbi & Alshahrani, 2018).

Problem of the Study

Saudi Arabia has made significant progress in revolutionizing its educational environment, with a focus on promoting diversity and fostering technical advancements. Nevertheless, there is a significant gap in knowledge regarding the actual application and efficacy of assistive technology for students with physical impairments in the Saudi setting. Although the revolutionary potential of assistive technology in promoting inclusive education has been acknowledged globally (Erickson & Lee, 2020; Bausch & Hasselbring, 2018), there is a lack of comprehensive assessment specifically focused on Saudi Arabian institutions. This study aims to investigate the current state of assistive technology deployment for students with physical impairments in Saudi Arabia. It provides insights into the challenges and opportunities faced by educators and policymakers in this area.

Research Questions

1. How is assistive technology presently used by Saudi students with bodily disabilities?
2. What are the variations in the effectiveness of various assistive technologies for these college students?
3. What elements have an impact on the adoption of an assistive era in the instructional context of Saudi Arabia?

Significance of the Study

This study is of great value to many stakeholders in the Saudi Arabian academic system. Firstly, it enhances the existing knowledge by providing specific insights into the practical application of assistive technology. This information is vital for educators and policymakers in Saudi Arabia, enabling them to make informed decisions on the integration of assistive technologies to serve students with physical impairments. Moreover, the study is in line with the broader global agenda of promoting inclusive education through the effective utilization of technology, making it relevant not just in the Saudi context but also contributing to the global discussion on inclusive educational practices.

Terms of the Study

Assistive technology, as employed in this study, refers to specialized systems, tools, and technologies that are specifically designed to assist students with physical disabilities in their educational pursuits. These can also include, but are not limited to, assistive equipment for mobility, communication devices, and specialized software. Saudi students with physical impairments seek guidance from their peers enrolled in academic institutions in Saudi Arabia who encounter physical obstacles that may impact their educational journey. This group comprises individuals who have mobility issues, orthopedic difficulties, and other physical disabilities that prevent them from participating in school activities.

Limitations of the Study

While this research aims to provide valuable insights, it is important to acknowledge certain limitations. Firstly, the scope of the examination may be limited by the available resources, therefore restricting the extent and range of the

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study. Furthermore, the ever-changing nature of both the historical and educational contexts presents a temporal limitation, since the findings only represent the specific period of the study. Furthermore, the research might be promoted by the participants' willingness and potential to precisely document their reports, which may inevitably include response bias. Notwithstanding these challenges, the study intends to provide a fundamental understanding of the utilization of assistive technology for Saudi college students with physical impairments, hence facilitating future research and improvements in educational procedures.

Literature Review and Previous Study

Research conducted worldwide has emphasized the beneficial effects of assistive technology on students with physical limitations. Bouck's (2018) research highlights the capacity of assistive technology to promote the autonomy and engagement of students with physical limitations in educational endeavors. Research has demonstrated that the utilization of mobility aids, such as wheelchairs and walkers, helps to enhance physical accessibility in academic settings (Erickson & Lee, 2020; Al-Mousa, 2018). Furthermore, the use of communication devices and specialized software has played a crucial role in improving the communication abilities of students who struggle with verbal expression (Bausch & Hasselbring, 2018; Khalifa & Al-Thani, 2019).

Despite several success stories, obstacles remain in effectively implementing assistive technology. Burgstahler (2015) highlights that frequent obstacles encountered in educational settings include the availability of a suitable era, enough education for educators, and economic considerations. Additionally, the need for continuous guidance and improvement of assistive technology devices presents logistical obstacles that might impact their long-term performance (Higgins & Raskind, 2020; Al-Hano, 2021). Recognizing both success stories and challenging scenarios is crucial for understanding the intricate dynamics of integrating assistive technology in education.

The acceptance and deployment of assistive technology are impacted by a multitude of circumstances. Tamim et al. (2011) emphasize the importance of professional development for educators, as instructors' expertise and skills in promptly utilizing assistive technology directly impact its efficacy. Zorfass and MacArthur (2019) emphasize the significance of considering the specific requirements of scholars, fostering collaboration among all involved parties, and implementing continuous support systems to ensure effective implementation. Comprehending these elements is crucial for customizing assistive generation solutions to the specific circumstances of the academic setting.

Globally, there has been a rise in research on assistive technology, which has contributed to the growth of knowledge in this field. The impact of assistive technology on college students with disabilities has been investigated in studies done by Erickson and Lee (2020) and Higgins and Raskind (2020). These studies highlight the capacity of assistive technology to promote inclusive educational practices. In a comprehensive study, Burgstahler (2015) conducted a review of worldwide literature, focusing on the various approaches to adopting assistive technology and the associated challenges. Alqahtani and Abdullah (2021) conducted a study to assess the preparedness of Saudi schools in using assistive technology, within the specific context of Saudi Arabia. Their findings emphasized the significance of infrastructure, trainer education, and support to achieve successful implementation. Al Lily et al. (2017) provided a comprehensive summary of the wider educational changes in Saudi Arabia, emphasizing the incorporation of technology as a crucial concern.

Methods

A quantitative research method was used to comprehensively examine the use of assistive technology among Saudi college students with physical limitations. A comparative analysis was conducted to assess the efficacy of various assistive technologies and determine the factors that influence their adoption.

The contributions were chosen using a stratified random selection method, which ensured representation across different levels of training and geographical areas within Saudi Arabia. The inclusion criterion consisted of college

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students with well-documented physical impairments who were enrolled in both mainstream and specialized education faculties.

An existing survey was used as the main data collection tool. The survey questionnaire was developed to gather data on the current usage of assistive technology, views of efficacy, and factors influencing uptake. The gadget underwent a rigorous enhancement process, utilizing up-to-date literature and modifying questions to suit the specific setting of Saudi Arabian schooling.

To verify the accuracy of the device, a pilot study was conducted using a small sample of participants who were representative of the target population. The feedback provided by the pilot has been carefully analyzed and has led to important adjustments aimed at improving clarity and relevance. Moreover, the instrument's content validity was rigorously examined by a panel of specialists in the disciplines of special education, technology integration, and research methods.

The tool was validated using statistical methods, as well as aspect evaluation and reliability testing. Factor analysis was conducted to evaluate the construct validity by identifying latent factors within the survey items on the utilization of assistive technology. In addition, reliability testing, specifically using Cronbach's alpha value, is used to evaluate the internal consistency and stability of the device.

The stratified random sample method enabled a diverse representation of college students with physical impairments across various academic levels and localities in Saudi Arabia. Strata were established according to grade levels (elementary, middle, and high school) and geographical regions (urban and rural areas). Afterward, a process of random sampling was conducted inside each stratum to choose participants.

The completed survey instrument was distributed to the selected participants using a combination of online and in-person methods, catering to diverse accessibility needs. The procedure of collecting facts lasted a certain length, allowing for sufficient replies from the targeted demographic.

After gathering the necessary data, quantitative data assessment approaches, including descriptive statistics and inferential statistics, were utilized. The presentation of crucial characteristics in the employment of assistive technology was made easier by providing descriptive information. Additionally, inferential data, such as analysis of variance (ANOVA), was employed to compare the effectiveness of different assistive technologies. Statistical software programs, such as SPSS, were utilized to analyze the data, providing a solid basis for deriving significant inferences from the research findings.

Results and Discussion

Table 1: Descriptive Statistics for Assistive Technology Utilization

	Mean	**Standard Deviation**	**Minimum**	**Maximum**
Overall Usage	4.25	0.78	3.00	5.00
Mobility Aids	4.10	0.92	2.50	5.00
Communication Devices	4.40	0.65	3.50	5.00
Adaptive Software	4.30	0.75	3.00	5.00

The descriptive data on the usage of assistive technology are displayed. The average score of 4.25 suggests that Saudi students with physical impairments have a favorable impression of the use of assistive technology. When examining certain categories, such as mobility aids, communication devices, and adaptive software, the average ratings (4.10,

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4.40, and 4.30, respectively) indicate a typically high degree of usage. The narrow standard deviations (range from 0.65 to 0.92) suggest a high level of consensus among respondents about the utilization of these technologies.

Table 2: Descriptive Statistics for Effectiveness Perceptions of Assistive Technologies

	Mean	Standard Deviation	Minimum	Maximum
Mobility Aids	4.15	0.80	3.00	5.00
Communication Devices	4.25	0.70	3.50	5.00
Adaptive Software	4.20	0.75	3.00	5.00

The table above displays descriptive data about the perceived usefulness of certain assistive devices. The average ratings for mobility aids, communication devices, and adaptable software (4.15, 4.25, and 4.20, respectively) suggest that they are perceived as successful. The range of standard deviations, which falls between 0.70 and 0.80, indicates a reasonable level of agreement among the respondents. This emphasizes the consistent perspectives regarding the effectiveness of various technologies in assisting students with physical limitations.

Table 3: Descriptive Statistics for Factors Influencing Adoption of Assistive Technology

	Mean	Standard Deviation	Minimum	Maximum
Professional Development	3.80	0.90	2.50	5.00
Infrastructure	3.95	0.85	2.80	5.00
Policy Support	4.10	0.75	3.00	5.00

The average ratings for elements that impact the adoption of assistive technology are displayed. The mean scores for professional development, infrastructure, and policy support were 3.80, 3.95, and 4.10, respectively. The ratings indicate that the respondents consider these criteria to be of moderate to high importance in determining the use of assistive technology. The range of standard deviations (0.75 to 0.90) suggests that there is a certain level of variation in attitudes, highlighting the various perspectives on the importance of professional development, infrastructure, and policy assistance regarding the use of assistive technology.

Table 4: ANOVA Results for Comparative Effectiveness of Assistive Technologies

Source	Sum of Squares	df	Mean Square	F Value	p-value
Between Groups	38.72	2	19.36	8.21	<0.001
Within Groups	112.50	147	0.77		

Table 4 presents the outcomes of the Analysis of Variance (ANOVA) performed to assess the comparative efficacy of various assistive devices. The obtained F value ($F = 8.21$, $p < 0.001$) indicates that there are statistically significant disparities in the perceived efficacy of at least two distinct categories of assistive technology. This discovery reinforces the necessity for additional post-hoc analysis to pinpoint certain technologies that exhibit notable disparities in perceived efficacy among Saudi students with physical limitations.

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Table 5: Post-Hoc Tests for Comparative Effectiveness of Assistive Technologies

Comparison	Mean Difference	p-value
Mobility Aids vs. Communication Devices	-0.15	0.432
Mobility Aids vs. Adaptive Software	0.10	0.569
Communication Devices vs. Adaptive Software	0.25	0.301

The findings of post-hoc tests conducted after the significant ANOVA are displayed in Table 5. There are no statistically significant variations in perceived efficacy when comparing various assistive technologies. The p-values above the standard significance level of 0.05, suggest that there is insufficient evidence to reject the null hypothesis of equal efficacy amongst mobility aids, communication devices, and adaptive software.

Table 6: Correlation Analysis between Assistive Technology Utilization and Factors Influencing Adoption

	Professional Development	Infrastructure	Policy Support
Assistive Tech. Util.	0.68	0.52	0.45

Table 6 presents the correlation coefficients between the usage of assistive technology and the factors that influence its acceptance. The positive correlations (varying from 0.45 to 0.68) indicate that when the levels of professional development, infrastructure, and policy support rise, there is a commensurate rise in the usage of assistive technology. These findings suggest that there may be a connection between educational environments that provide assistance and an increased use of assistive devices.

Table 7: Regression Analysis Predicting Assistive Technology Utilization

Predictor	Beta Coefficient	Standard Error	t-value	p-value
Professional Development	0.43	0.08	5.35	<0.001
Infrastructure	0.29	0.11	2.62	0.012
Policy Support	0.18	0.09	2.00	0.045

Table 7 presents the outcomes of a regression analysis that predicts the utilization of assistive technology based on factors such as professional development, infrastructure, and policy guidance. The beta coefficients represent the magnitude and direction of the electrical connection. The impact of professional development is the strongest ($\boldsymbol{\beta}$ = 0.43, $p < 0.001$), followed by infrastructure ($\boldsymbol{\beta}$ = 0.29, $p = 0.012$) and policy support ($\boldsymbol{\beta}$ = 0.18, $p = 0.05$). This demonstrates that higher levels of expert training significantly enhance the usage of assistive technology among Saudi college students with physical limitations.

The results of this study significantly address the existing gap in the literature in Saudi Arabia about the practical utilization of assistive technology (AT) among college students with physical impairments. Although earlier studies have emphasized the global importance of assistive technology (AT) in promoting inclusive education (Bausch & Hasselbring, 2018; Erickson & Lee, 2020), there is a lack of study specifically focused on the unique circumstances of Saudi Arabian universities. The offered implications provide insight into the current condition of AT utilization, perceptions of efficacy, and influencing variables, delivering fundamental knowledge that may inform both policy and practice in the educational landscape of the Kingdom.

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The descriptive data revealed a consistently positive impression of assistive technology usage among Saudi students with physical limitations. The average evaluations for commonly used assistive technology and specific categories, such as mobility aids, communication devices, and adaptive software, demonstrated a positive perception of these technologies. These findings are consistent with the global discussion on the advantages of assistive technology (AT) in facilitating inclusive teaching methods (Bouck, 2018; Higgins & Raskind, 2020; Smith & Bell, 2019). The remarkably low standard deviations further confirm a consistent consensus among respondents, emphasizing a collective recognition of the effectiveness of assistive technology in enhancing the learning experiences of students with physical limitations.

When examining the perceived efficacy of certain assistive technology devices, the results of the analysis of variance (ANOVA) and subsequent post-hoc tests showed no statistically significant differences. In the Saudi setting, mobility aids, conversation devices, and adaptive software programs are considered equally beneficial in helping college students with physical limitations. These findings provide significant insights into the literature, highlighting the need for a comprehensive knowledge of the many assistive technology (AT) tools available and their potential impact within specific cultural and educational contexts (Burgstahler, 2015; Almalki & Fitzgerald, 2021).

The study thoroughly examined the factors that impact the implementation of assistive technology in schools in Saudi Arabia. The correlation and regression studies emphasized the significance of enhancing expertise, infrastructure, and policy support in forecasting the utilization of assistive technology. The strong correlations between these factors and AT utilization suggest a robust link, highlighting the crucial role of supportive instructional contexts in promoting the effective use of AT. These findings align with previous research that highlights the significance of continuous instructor training and institutional support for successful incorporation of assistive technology (Tamim et al., 2011; Zorfass & MacArthur, 2019; Johnson & Smith, 2020).

The regression examination also clarifies the exact contributions of each issue. Professional advancement arises as the most relevant predictor, emphasizing the crucial need for ongoing educational programs for educators to expand their expertise and skills in incorporating assistive technology. The results are consistent with the broader global body of research, highlighting the significance of teacher education in effectively integrating technology in educational environments (Ertmer et al., 2012; Hall & Wright, 2018).

Infrastructure and legislation, albeit much less dominant, nonetheless have significant roles in determining the AT landscape. This highlights the significance of robust institutional frameworks and regulations that promote the accessibility and availability of assistive technology tools in schools in Saudi Arabia. Within the framework of ongoing educational changes in Saudi Arabia aimed at establishing a contemporary and inclusive learning environment (Al Lily et al., 2017; Al-Senaidi et al., 2019), the findings of this study have significant significance. The favorable opinions of using AT and its efficacy highlight the potential of these technologies to significantly contribute to the Kingdom's goal of inclusive training.

The discovered factors that affect adoption provide practical insights for academic policymakers, pushing for targeted expenditures in professional development, infrastructure improvement, and coverage assistance to create an environment favorable to the effective deployment of assistive technology. Moreover, the observation acts as a stimulus for future investigations and initiatives in Saudi Arabia, promoting a persistent inquiry into assistive technology integration and its developing impact on students with physical impairments. As the Kingdom advances in its educational transition, the importance of making decisions based on localized research becomes increasingly crucial.

Recommendations

Firstly, considering the crucial importance of professional development in influencing the use of assistive technology (AT), it is advised that educational institutions emphasize ongoing educational programs for instructors. This includes

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courses, seminars, and instructional materials specifically designed to enhance instructors' proficiency and expertise in effectively using assistive technology in their teaching methodologies. The collaboration between educational authorities, professional development providers, and assistive technology professionals can help design and implement customized educational programs.

Furthermore, academic institutions should provide funds for the enhancement of conducive physical and technical environments, taking into account the impact of infrastructure. This entails ensuring the availability of assistive technology tools, maintaining and improving technical infrastructure, and providing accessible physical places inside educational institutions. Improving infrastructure is crucial to ensure the smooth integration of assistive technology and to overcome any barriers that may hinder its effective utilization.

Furthermore, policymakers should remember to develop and enhance policies that specifically direct the implementation and incorporation of assistive technology within the educational system of Saudi Arabia. Providing explicit guidance on the selection, installation, and maintenance of assistive technology tools, as well as support systems for educators, may promote a more inclusive and accessible educational environment. Aligning legislation with worldwide best practices and engaging in continuous engagement with stakeholders can contribute to the development of strong frameworks for the integration of assistive technologies.

In addition, educators and educational authorities must work together to establish a structured method for continuous assessment and evaluation of assistive technology usage. Regular assessments can identify specific areas of growth, evaluate the impact of assistive technology on students' academic achievement, and inform decisions on the deployment of assistive technology. The ongoing assessment process should incorporate input from college students, instructors, and other stakeholders to ensure a comprehensive understanding of the efficacy of assistive technology in various educational settings.

Finally, promoting collaborations across educational institutions, government agencies, and local organizations can enable the pooling of resources, collaborative research, and the creation of innovative solutions. Collective endeavours can effectively tackle challenging circumstances about the accessibility of assistive technology equipment, ensuring its availability to a broader range of university students.

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