FEELING AND LISTENING CLOSER WITH ARTIFICIAL INTELLIGENCE: AN EXPERIMENTAL STUDY

SENTIRSI PIÙ VICINO CON L'INTELLIGENZA ARTIFICIALE: UNO STUDIO SPERIMENTALE

Giorgia Del Bianco
Università Telematica Pegaso, Università degli Studi di Foggia
giorgiadelbianco@icloud.com

Lucia Monacis
Università degli Studi di Foggia
lucia.monacis@unifg.it

Giuseppe Annacontini
Università degli Studi di Foggia
giuseppe.annacontini@unifg.it

Double Blind Peer Review

Citazione
Del Bianco, G., Monacis, L., & Annacontini, G. (2024). Feeling and listening closer with artificial intelligence: an experimental study. *Giornale Italiano di Educazione alla Salute, Sport e Didattica Inclusiva*, 8(2), Edizioni Universitarie Romane.

Doi:
https://doi.org/10.32043/gsd.v8i3.1127

Copyright notice:
© 2023 this is an open access, peer-reviewed article published by Open Journal System and distributed under the terms of the Creative Commons Attribution 4.0 International, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

gsdjournal.it
ISSN: 2532-3296
ISBN 978-88-7730-494-0

ABSTRACT
This study aimed to analyze the effect of the application of Artificial Intelligence (AI) on emotional well-being in educational context among adolescents with special needs. The sample was composed by 135 Austrian deaf adolescents (Mage=13, SD=1.38) who completed a self-report questionnaire assessing levels of self-esteem before and after intervention based on a specific technological device (Storysign software that is attentive to emotional skills). Findings showed significant difference in pre-post test score, thus demonstrating an increased level on the mean values of the self-esteem (M=14, SD=2.34 vs M=21 SD=1.38, $p < 0.005$). Furthermore, no significant difference emerged between males and females. Although other studies are needed to confirm such positive effect of an AI-implemented tool among deaf adolescents, this investigation provides initial empirical evidence of how AI could be integrated in the framework of the Universal Design for Learning

Questo studio si proponeva di analizzare l'effetto dell'applicazione dell'Intelligenza Artificiale (IA) sul benessere emotivo in un contesto educativo tra adolescenti con bisogni speciali. Il campione era composto da 135 adolescenti sordi austriaci (Mage=13, SD=1,38) che hanno compilato un questionario self-report per valutare i livelli di autostima prima e dopo l'intervento basato su uno specifico dispositivo tecnologico (software Storysign attento alle competenze emotive). I risultati hanno mostrato una differenza significativa nel punteggio del test pre-post, dimostrando un aumento dei valori medi dell'autostima (M=14, SD=2,34 vs M=21 SD=1,38, $p <0,005$). Inoltre, non sono emerse differenze significative tra maschi e femmine. Sebbene siano necessari altri studi per confermare l'effetto positivo di uno strumento implementato con l'IA tra gli adolescenti sordi, questa indagine fornisce una prima evidenza empirica di come l'IA possa essere integrata nel quadro dell'Universal Design for Learning.

KEYWORDS
Artificial intelligence, learning, self-esteem, inclusive education
Intelligenza artificiale, apprendimento, autostima, educazione

Received 30/04/2024
Accepted 14/06/2024
Published 24/06/2024

Introduction

1. Artificial Intelligence

The field of Artificial Intelligence (AI) has grown exponentially in recent decades, succeeding in making impossible and merely imaginable things possible. The concept of artificial intelligence is complex and varied, it can include different shades of human invention, but it can be encapsulated in a single definition by stating that Artificial Intelligence refers to human intelligence simulated in machines programmed to think like humans and replicate their actions. (Kudrinko et al., 2021)

Any computer or machine that displays characteristics similar and akin to the human brain such as for learning or problem solving can be defined as artificial intelligence. AI machines can formulate decisions and take actions like human beings. The overall goal behind AI implemented machines is to create a way of reasoning, creating solutions to problems. The specific skills these machines are equipped with are a mixture of natural language processing (NLP), expert systems, neural networks and robotics (El Naggar et al., 2024).

Robotics is the use of expert robots in a particular task in a real-time environment. Algorithms and computer programmers are the elementary units of robots that enable them to function in a computer-simulated environment (Papastratis et al., 2021).

2. Sign language

Sign language (SL) is the main means of communication between deaf people, who are able to express themselves through manual movements. These movements are combined together to form concepts with logical meaning that can be translated into sentences. Having sign language is the only way that people with deafness can communicate, converse and make themselves understood (Haug et al., 2023). Many studies have been on the need to develop new sign language strategies and technologies to facilitate communication and social inclusion of people with hearing impairments (Wadhawan & Kumar, 2021).

Although the development of such technologies can be really challenging due to the existence of numerous sign languages and the lack of large, annotated datasets, recent advances in artificial intelligence and machine learning have played a significant role in automating and improving such technologies (Papastratis et al., 2021).

Recent literature reviews have examined new technologies specific to sign language, such as video- and sensor-based sign language recognition and sign language translation (Kohli et al., 2021).
Artificial intelligence, being able to think and design things in a similar way to a human being has been a great ally in the field of education from the very beginning. Many tools have been developed to meet the needs of students at all levels of education and AI seems to help both students and teachers; in fact, the concept of AI technology is constantly being applied to the education sector (Kudrinko et al., 2021).
Artificial intelligence created by humans can foster competence, personalization and simplification of tasks and in education it has the role of collaborating in teaching and learning for the benefit of students. It seems that artificial intelligence may become the future of educational education and will have a huge impact on the way teachers and students work (Parton, 2005).
This study aimed to analyze the effect of the application of Artificial Intelligence (AI) on emotional well-being in educational context among adolescents with special needs.

Method

To evaluate the effect of using apps implemented by artificial intelligence in the learning of children with deafness, we used the StorySign app.
Storysign is an app created to help the deaf population translate sign language in real time. You need to scan the pages of the books to start the translation through sign language.
During the animation, the movement of the sign language is very accurate, providing an immediate translation of the writing into sign language.
The process by which Storysign manages to translate the language is quite complex: there are “actors” in a motion capture rig with a high-fidelity marker setup that records the entire body and facial performance from more than 70 infrared cameras placed in the studio. These performances were then matched to the books using an artificial intelligence-based image and text system.
The books are available in 14 languages.
Between March 2022 and April 2023 in Vienna, Austria, 135 adolescent students (129 boys and 36 girls) with deaf blindness aged 12-17 years (Mean age =13, SD=1.38) were recruited for the study. The participants attended 10 lessons using the Storysign software and 10 lessons without using it and at the end completed a self-report questionnaire, Rosenberg self-esteem scale, to assess their levels of self-

esteem before and after the intervention, independent of their school performance.

The Rosenberg self-esteem scale is a 10-item scale that measures global self-esteem by measuring both positive and negative feelings about self. The scale is considered to be one-dimensional. All items are answered using a 4-point Likert scale ranging from strongly agree to strongly disagree.

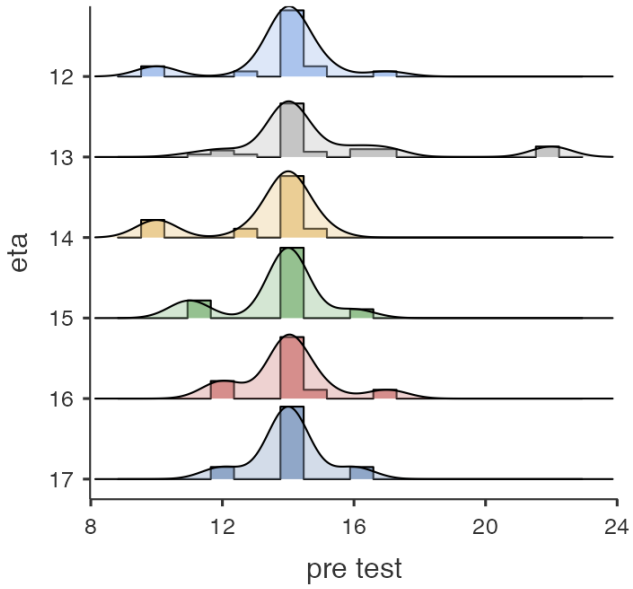
The scale ranges from 0 to 30. Scores between 15 and 25 are within the normal range; scores below 15 suggest low self-esteem.

After carrying out the descriptive analyses to get an overall picture of the sample, a T-test was also performed to assess any difference in scores between the male and female participants. All statistical analyses were carried out using Jamovi Statistic software.

Results

The results of the Rosenberg self-esteem scale showed a significant difference in the pre-post-intervention score using the Storysign software. From the administration of the Rosenberg scale before the intervention with Storysign, the results show an overall mean value of the Austrian adolescents' self-esteem of 14 with standard deviation 2.34. (Table1)

Table1



While the results of the post-intervention Rosenberg scale show an overall mean value of 21 with SD: 1.38, $p<0.005$ (Table2) thus demonstrating an increase in the level of mean values of self-esteem (Table3).

Furthermore, the T-test to assess any difference in scores between male and female participants showed no significant difference between males and females ($p>0.005$)

Table2

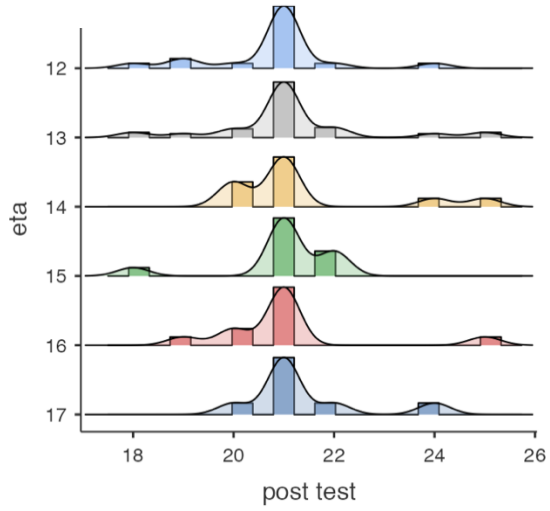
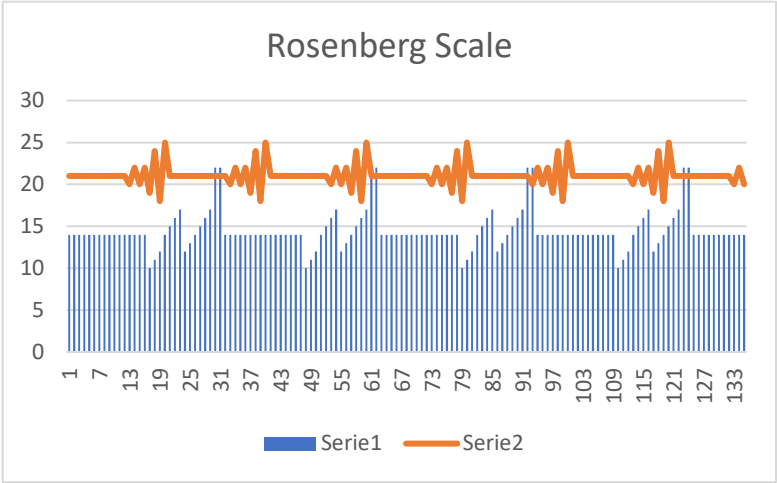


Table3



Discussion

Preliminary data from the pre-test and post-test study of Austrian adolescents show that the use of artificial intelligence-supported software in the learning of deaf and dumb adolescents can promote an increase in the general level of self-esteem. From the results of the study, it can be deduced that the use of artificial intelligence-supported software can help adolescents with difficulties in diversity contexts to feel better, to be more involved and motivated, and it seems that this software can help to decrease the distance created by difficulties. The deaf and dumb children responded positively to the preliminary study carried out and the Rosenberg scale allowed us to observe how their general self-esteem values improved after the classroom experience with Storysign.

Limits

The study emphasizes the connection between aspects of artificial intelligence and educational processes for special learners. The study suggests that although artificial intelligence can improve the level of self-esteem with personalized

learning, it also introduces new challenges that need to be addressed and highlights several limitations of our study. The data of the study are promising but not enough to be generalized, in fact more studies are needed to state that the use of applications implemented by artificial intelligence can have positive effects on the self-esteem of children with special educational needs. The purpose of the article was to chart a new course, while recognizing that the results are not sufficient. It would be interesting to continue the study, specifically analyzing in which aspects the children's general self-esteem seems to improve, in which specific situations they feel more self-confident. It would be interesting to carry out a study with more specific age groups of the participants, as adolescence ranging from 11 to 18 years is a vast period characterized by changes, mental as well as physical, and each individual age group has different nuances and moments in which self-esteem is different, so in a future study it would be necessary to divide the statistical analyses by smaller age groups. Although no significant difference emerged between male and female scores, it should be noted that the female sample was much smaller than the male sample and that future studies could focus on the gender difference. It would be interesting to note whether the use of the software implemented by the artificial intelligence storyline is linked in any way to performance, improvement in a specific subject or whether it remains an improvement in pupil perception.

Conclusion

Although many more studies are needed to confirm the positive effect of a tool implemented by artificial intelligence in contexts of diversity and difficulty and in the learning of deaf adolescents, this initial investigation provides the first empirical evidence showing that artificial intelligence can be integrated into the Universal Design for Learning framework. The goal of the research was to demonstrate that diversity contexts can be helped and alleviated by new tools, that it is possible to help more and more children with difficulties, and that artificial intelligence can be a good ally in this battle for inclusion and to provide new tools to help them feel more closely connected.

References

El Naggar, A., Gaad, E., & Inocencio, S. A. M. (2024). Enhancing inclusive education in the UAE: Integrating AI for diverse learning needs. *Research in Developmental Disabilities*, *147*, 104685. https://doi.org/10.1016/j.ridd.2024.104685

Haug, T., Mann, W., & Holzknecht, F. (2023). The Use of Technology in Sign Language Testing: Results of a Pre-Pandemic Survey. *Sign Language Studies*, *23*(2), 243–281. https://doi.org/10.1353/sls.2023.0003

Kohli, R., Phutela, S., Garg, A., & Viner, M. (2021). Artificial Intelligence Technology to Help Students With Disabilities: Promises and Implications for Teaching and Learning. In A. Singh, C. J. Yeh, S. Blanchard, & L. Anunciação (A c. Di), *Advances in Early Childhood and K-12 Education* (pp. 238–255). IGI Global. https://doi.org/10.4018/978-1-7998-7630-4.ch013

Kudrinko, K., Flavin, E., Zhu, X., & Li, Q. (2021). Wearable Sensor-Based Sign Language Recognition: A Comprehensive Review. *IEEE Reviews in Biomedical Engineering*, *14*, 82–97. https://doi.org/10.1109/RBME.2020.3019769

Papastratis, I., Chatzikonstantinou, C., Konstantinidis, D., Dimitropoulos, K., & Daras, P. (2021). Artificial Intelligence Technologies for Sign Language. *Sensors*, *21*(17), 5843. https://doi.org/10.3390/s21175843

Parton, B. S. (2005). Sign Language Recognition and Translation: A Multidisciplined Approach From the Field of Artificial Intelligence. *Journal of Deaf Studies and Deaf Education*, *11*(1), 94–101. https://doi.org/10.1093/deafed/enj003

Wadhawan, A., & Kumar, P. (2021). Sign Language Recognition Systems: A Decade Systematic Literature Review. *Archives of Computational Methods in Engineering*, *28*(3), 785–813. https://doi.org/10.1007/s11831-019-09384-2