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Explaining the Emotional and Psychological Impact of Assistive Technologies on Adolescents with Visual Impairments

Nayelli. Muñoz[1], Bridget. Abalorio[1*]

[1] Faculty of Health Sciences, Private University of the North, Lima, Peru

*** Corresponding author email address**: bridget.abaloro@upc.edu.pe

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A B S T R A C T

This study explores the emotional and psychological impact of assistive technologies on adolescents with visual impairments. A qualitative research design was employed using semi-structured interviews with 20 adolescents with visual impairments recruited through online platforms. Theoretical saturation guided data collection, and NVivo software was used for thematic analysis. The study examined participants' emotional responses, psychological adaptation, and the social and educational impacts of assistive technology use. The results revealed that while assistive technologies enhanced empowerment, independence, and self-esteem, they also introduced challenges such as frustration, technological overwhelm, and social stigma. Many participants reported emotional attachment to their assistive devices, highlighting their role in fostering confidence and reducing dependence. However, rapid technological advancements contributed to anxiety and stress, particularly when transitioning to new tools. Psychological adaptation strategies included trial-and-error learning, seeking technical support, and developing resilience. Social support from parents, teachers, and peers played a crucial role in shaping participants' experiences, with inadequate support leading to increased frustration. The digital divide further influenced participants' emotional well-being, as access to advanced assistive technologies varied across socioeconomic backgrounds, impacting academic performance and social inclusion. Assistive technologies significantly shape the emotional and psychological well-being of adolescents with visual impairments by promoting independence and confidence while also posing adaptation challenges. The findings highlight the need for better accessibility training for educators, increased social support, and user-centered technological designs to reduce cognitive load and frustration. Bridging the digital divide is essential to ensure equitable access to advanced assistive technologies, fostering positive developmental outcomes for visually impaired adolescents.

Keywords: *Assistive technologies, visual impairment, adolescent psychology, independence, emotional adaptation, digital divide, educational accessibility.*

1. Introduction

Adolescence is a critical developmental period characterized by identity formation, social integration, and academic progress. For adolescents with visual impairments, these developmental tasks can be significantly influenced by the presence of assistive technologies, which play a crucial role in facilitating independence, academic success, and social inclusion. Assistive technologies, including screen readers, Braille displays, mobility aids, and AI-based solutions, provide individuals with visual impairments greater access to education, communication, and daily activities (Abdulhakeem et al., 2024; Sajjad & Ismail, 2024). However, beyond their functional advantages, these technologies have profound emotional and psychological effects, shaping the self-perception, confidence, and overall well-being of visually impaired adolescents (Szekely et al., 2025). Understanding these impacts is essential for developing more effective and user-centered technological interventions that align with the psychological and emotional needs of users.

The emotional and psychological effects of assistive technologies are multifaceted. While they can promote empowerment and independence, they may also introduce challenges such as frustration, anxiety, and social stigmatization (Rastogi & Srivastava, 2024; Sidiqua, 2022). The sense of empowerment associated with assistive technology use is well-documented, as these tools enable visually impaired individuals to perform academic and daily tasks with greater autonomy (Nazir et al., 2024). Many adolescents report that assistive devices enhance their self-confidence by allowing them to keep pace with their sighted peers, reducing feelings of dependence (Manitsa & Barlow Brown, 2022). However, these positive effects are not universal, as some users experience significant stress due to technical difficulties, lack of accessibility, or the constant need to adapt to evolving technologies (Kim, 2023).

One of the key psychological challenges associated with assistive technologies is the cognitive and emotional burden they place on users. The learning curve associated with new devices can be overwhelming, particularly for adolescents who must balance their academic responsibilities with the need to master complex technological tools (Jannah et al., 2023). Some studies indicate that the transition to new assistive devices can lead to anxiety and self-doubt, especially when adequate training and support are lacking (Salam, 2025). Additionally, emotional attachment to specific technologies is common among users, as these devices become integral to their daily routines and identity (Gawande, 2024). Adolescents often develop strong preferences for familiar technologies, making it difficult for them to transition to newer systems, even when those systems offer improved functionality (Tyron et al., 2024).

The role of social support in mitigating the psychological challenges of assistive technology use is critical. Parents, teachers, and peers play a significant role in shaping adolescents' experiences with these technologies (Shevkar et al., 2024). Supportive social environments can facilitate positive adaptation, increase motivation, and enhance self-efficacy among users (Dolzake, 2024). Conversely, a lack of social understanding or inadequate training on the part of educators can exacerbate feelings of frustration and exclusion (Stanley, 2023). Some adolescents report that their teachers are unfamiliar with assistive technologies, leading to ineffective integration of these tools in classroom settings (Arifin et al., 2024). Additionally, peer perceptions of assistive technology use can influence adolescents' social experiences, with some individuals feeling isolated or stigmatized when using specialized devices in public settings (Dikici & Sikinbayev, 2024).

The digital divide further complicates the emotional and psychological impact of assistive technologies. While some adolescents have access to advanced AI-driven assistive tools, others are limited to outdated or less effective technologies due to financial or institutional constraints (Mankar et al., 2024). This disparity can create additional stress and frustration for visually impaired students who recognize the potential benefits of newer technologies but are unable to access them (Grigoryeva et al., 2022). The need for equitable access to high-quality assistive technology is therefore a pressing issue that must be addressed through policy changes and increased investment in inclusive education (Saini, 2021).

The educational impact of assistive technologies is another crucial dimension of their psychological effects. Research has demonstrated that well-implemented assistive technologies can significantly enhance learning outcomes for visually impaired students, providing them with greater access to educational materials and interactive learning experiences (Abdulhakeem et al., 2024). However, the effectiveness of these technologies is highly dependent on their usability and the level of training provided to both students and educators (Nazir et al., 2024). Some adolescents report that while assistive technologies improve their academic performance, they also introduce new

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challenges, such as difficulties in navigating poorly designed digital interfaces or incompatibility with mainstream educational platforms (Kuzdeuov et al., 2023).

In addition to academic outcomes, assistive technologies influence identity development among adolescents with visual impairments. Adolescence is a period of self-exploration, and the use of assistive devices can shape individuals' perceptions of their own abilities and limitations (S. et al., 2025). Some adolescents embrace these technologies as tools of empowerment, while others struggle with the fear of being defined by their disability (Yuan & Zhou, 2024). The balance between reliance on assistive tools and the desire for independence is a complex psychological process that varies among individuals (Szekely et al., 2025).

The role of emerging technologies in enhancing the emotional and psychological well-being of visually impaired adolescents is an area of growing interest. Advances in AI-driven assistive devices, wearable technology, and interactive learning applications hold promise for improving user experiences and reducing some of the common stressors associated with assistive technology use (Filetti et al., 2024). AI-based assistive tools, such as smart navigation systems and real-time object recognition software, are increasingly being designed to enhance the independence and confidence of visually impaired users (Mnyanyi, 2023). However, the adoption of these technologies is not without challenges, as issues such as affordability, accessibility, and user training must be carefully considered (Salam, 2025).

Despite the potential benefits of assistive technologies, it is crucial to acknowledge the barriers that still exist in their widespread adoption and effectiveness. Some adolescents report difficulties in accessing user-friendly designs, encountering compatibility issues, or experiencing frequent technical failures (Rastogi & Srivastava, 2024). The reliability of assistive technologies is a key concern, as malfunctions or poorly integrated features can lead to significant frustration and hinder users' daily activities (Kim, 2023). Additionally, the rapid evolution of assistive technology presents a continuous challenge, as users must frequently adapt to new systems while maintaining their academic and social responsibilities (Manitsa & Barlow Brown, 2022).

This study aims to provide a comprehensive analysis of the emotional and psychological impact of assistive technologies on adolescents with visual impairments.

2. Methods and Materials

2.1. Study Design and Participants

This study employs a qualitative research design to explore the emotional and psychological impact of assistive technologies on adolescents with visual impairments. A phenomenological approach was chosen to gain in-depth insights into participants' lived experiences, perceptions, and emotional responses related to the use of assistive technologies. The study utilized semi-structured interviews as the primary data collection method, ensuring a flexible yet structured exploration of participants' thoughts and feelings. The sample consisted of 20 adolescents with visual impairments, recruited through online platforms. Participants were selected using purposive sampling to ensure diversity in terms of age, gender, level of visual impairment, and experience with assistive technologies. The sample size was determined based on the principle of theoretical saturation, whereby data collection continued until no new themes or insights emerged.

2.2. Measure

2.2.1. Semi-Structured Interview

Data collection involved semi-structured interviews conducted through online video or audio calls, depending on participants' preferences and accessibility needs. The interview protocol included open-ended questions designed to elicit personal experiences, challenges, and emotional responses associated with the use of assistive technologies in daily life, education, and social interactions. Interviews were conducted in a conversational manner to encourage rich and detailed narratives while maintaining consistency across participants. Each interview lasted approximately 45–60 minutes and was audio-recorded with participants' consent for accurate transcription and analysis. Additional field notes were taken to capture non-verbal cues and contextual factors influencing participants' responses. Ethical considerations were strictly observed, ensuring voluntary participation, confidentiality, and the right to withdraw at any stage of the study.

2.3. Data Analysis

Data analysis was conducted using NVivo software to systematically code and categorize emerging themes. Thematic analysis was applied following Braun and Clarke's six-step framework: familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report.

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Initial coding was done inductively, allowing themes to emerge from participants' narratives rather than being pre-determined. Constant comparison techniques were employed to refine categories and establish connections between themes. The credibility of findings was enhanced through peer debriefing, member checking, and maintaining an audit trail to document coding decisions and interpretations. The final themes provide a comprehensive understanding of how assistive technologies shape the emotional and psychological well-being of adolescents with visual impairments.

3. Findings and Results

The demographic characteristics of the participants in this study indicate a diverse sample of adolescents with visual impairments recruited through online platforms. The study included 20 participants, ranging in age from 13 to 19 years, with a mean age of 16.2 years (SD = 1.9). Among them, 12 participants (60%) were male, and 8 participants (40%) were female. Regarding the degree of visual impairment, 9 participants (45%) were classified as blind, while 11 participants (55%) had low vision. In terms of educational status, 14 participants (70%) were enrolled in mainstream schools with assistive technology support, whereas 6 participants (30%) attended specialized schools for visually impaired students. The duration of assistive technology use varied among the participants, with 7 participants (35%) using such technology for less than three years, 8 participants (40%) between three and five years, and 5 participants (25%) for more than five years. The participants also reported varying levels of technological proficiency, with 10 participants (50%) identifying as highly proficient, 7 participants (35%) as moderately proficient, and 3 participants (15%) as beginners in using assistive technologies.

Table 1

The Results of Qualitative Analysis

Categories	Subcategories	Concepts
Emotional Responses to Assistive Technologies	Empowerment and Independence	Increased autonomy, Greater sense of control, Self-reliance, Enhanced mobility
	Frustration and Anxiety	Stress over device malfunctions, Fear of dependency, Anxiety in learning new technology
	Emotional Attachment to Devices	Emotional bonding with familiar tools, Personification of devices, Comfort in device use
	Sense of Normalcy	Feeling 'normal' with assistive tech, Reduced stigma in social settings
	Technological Overwhelm	Overwhelmed by rapid tech changes, Cognitive load, Burnout from excessive use
	Self-Esteem and Confidence	Improved self-image, Pride in mastering technology
Psychological Adaptation and Coping Strategies	Coping with Technological Challenges	Trial-and-error learning, Seeking technical support, Adjusting expectations, Managing setbacks
	Developing Resilience	Learning from failures, Adapting to updates
	Identity and Assistive Technology	Balancing technology with self-perception, Avoiding over-identification with disability
	Acceptance and Motivation	Encouragement from success stories, Intrinsic drive to use technology
	Parental and Peer Support	Reassurance from family, Comparisons with sighted peers
Social and Educational Impacts of Assistive Technologies	Social Inclusion and Peer Perceptions	Building friendships through tech, Feeling excluded in non-tech settings, Stereotypes from peers
	Educational Accessibility	Accessible materials, Interactive learning experiences
	Teacher Support and Training	Training gaps among educators, Teachers' willingness to adapt
	Digital Divide	Limited access to latest technology, Economic barriers, Policy implications
	Future Aspirations	Career ambitions with technology, Desire for self-improvement
	Barriers to Technology Use	Lack of user-friendly design, Compatibility issues, Reliability concerns
	Emotional Resilience in Learning	Managing frustration in learning, Staying motivated despite obstacles

The findings of this study reveal three main thematic categories concerning the emotional and psychological impact of assistive technologies on adolescents with visual impairments: emotional responses, psychological adaptation and coping strategies, and social and educational impacts. Each category encompasses several subcategories that emerged from the participants' narratives, illustrating their diverse experiences with assistive technologies.

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In terms of emotional responses to assistive technologies, many participants expressed a sense of empowerment and independence, highlighting how these tools allow them to navigate their environment with greater autonomy. One participant stated, "Using my screen reader makes me feel like I don't have to rely on others for everything; I can do things at my own pace." However, some participants reported frustration and anxiety, particularly regarding device malfunctions or the learning curve associated with new technologies. "Sometimes, my device stops working at the worst moment, and I feel completely helpless," one adolescent shared. Emotional attachment to devices was also evident, with some describing their assistive technologies as comforting and familiar. "I've had my Braille display for years; it's like a part of me," said one participant. Additionally, many reported a sense of normalcy when using assistive technology, as it helped them engage in daily activities without standing out. "With my speech-to-text software, I can keep up with my classmates without anyone even noticing," mentioned another adolescent. However, some described experiencing technological overwhelm due to the constant evolution of assistive tools, which sometimes made them feel pressured to keep up. "Every time I master a new tool, something newer comes out, and I feel like I'm always behind," one participant admitted. For some, the successful use of assistive technologies enhanced self-esteem and confidence, with a participant noting, "When I manage to troubleshoot my device on my own, I feel really proud of myself."

Psychological adaptation and coping strategies also played a crucial role in shaping participants' experiences. Many adolescents described coping with technological challenges through trial-and-error learning, seeking technical support, and adjusting their expectations when faced with difficulties. "At first, I got really frustrated, but then I realized I had to be patient and just keep trying," said one participant. Developing resilience was a common theme, with participants discussing how learning from failures and adapting to updates helped them persist. "When something doesn't work, I don't give up; I try different ways until I figure it out," one adolescent shared. Some participants reflected on their identity and assistive technology, describing efforts to balance their self-perception with the role of technology in their lives. "I don't want my device to define me, but I also know I need it to function well," said one participant. Acceptance and motivation were also significant factors, as many participants found encouragement in success stories and had an intrinsic drive to master their technologies. "I saw older students using assistive tech so well, and that made me want to get better at it too," explained an adolescent. Parental and peer support further influenced participants' experiences, with one adolescent stating, "My parents always tell me that using technology makes me stronger, not weaker."

The social and educational impacts of assistive technologies were equally profound. Many participants described social inclusion and peer perceptions as an important factor in their emotional well-being. Some expressed that assistive technologies helped them build friendships, while others reported feeling excluded in settings where such technology was not readily accepted. "My friends think my screen reader is cool, but some people treat me differently when they hear it," one adolescent remarked. Educational accessibility was another key concern, with participants emphasizing the benefits of accessible learning materials and interactive digital tools. "I love that I can access my textbooks online now, unlike before when I had to wait for a Braille version," said one participant. However, teacher support and training were inconsistent, with some educators being well-equipped to assist students with visual impairments, while others lacked the necessary skills. "Some teachers understand my needs right away, while others just don't know what to do," a participant shared. The digital divide presented additional barriers, as access to the latest assistive technologies was often limited due to financial constraints or institutional policies. "I wish I could afford the newest device, but my school only provides basic ones," one adolescent explained. Despite these challenges, many participants had future aspirations that involved technology, expressing a desire for self-improvement and career ambitions. "I want to work in tech myself one day and make better tools for people like me," said one adolescent. Lastly, barriers to technology use, such as lack of user-friendly design and compatibility issues, were frequently mentioned. "Sometimes, different apps don't work well together, and it makes things harder," a participant noted. Nonetheless, emotional resilience in learning helped many adolescents overcome these obstacles, with one participant stating, "Even when I struggle, I remind myself that every challenge is a step toward being more independent."

4. Discussion and Conclusion

The findings of this study reveal the complex emotional and psychological impact of assistive technologies on

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adolescents with visual impairments. Three key themes emerged from the analysis: emotional responses to assistive technologies, psychological adaptation and coping strategies, and social and educational impacts. While assistive technologies provided many participants with a sense of empowerment and independence, they also introduced challenges such as frustration, technological overwhelm, and social stigma. These findings align with existing research emphasizing the dual nature of assistive technologies, which can serve both as facilitators of autonomy and as sources of psychological strain (Abdulhakeem et al., 2024; Szekely et al., 2025).

One of the most significant findings of this study is the sense of empowerment and increased self-esteem that assistive technologies provide for adolescents with visual impairments. Many participants reported that assistive tools enabled them to engage in academic, social, and daily activities with greater confidence and autonomy. This is consistent with previous research highlighting the role of assistive technology in enhancing self-efficacy and reducing dependence on others (Manitsa & Barlow Brown, 2022; Nazir et al., 2024). Similarly, studies have found that when adolescents successfully integrate assistive technologies into their routines, they experience a greater sense of control over their environment, which positively affects their emotional well-being (Saini, 2021; Shevkar et al., 2024). However, while empowerment was a common experience, some participants expressed frustration and anxiety, particularly when dealing with device malfunctions or learning new technologies. This aligns with prior studies that have noted the cognitive and emotional burden of technology use, especially when adolescents must repeatedly adjust to new systems or troubleshoot technical failures (Jannah et al., 2023; Kim, 2023).

The study also highlights the emotional attachment that some adolescents develop toward their assistive devices, viewing them as essential components of their daily lives. Several participants described their assistive technologies as comforting and familiar, an experience that has been documented in previous research exploring the psychological dimensions of technology reliance among visually impaired users (Dikici & Sikinbayev, 2024; Salam, 2025). However, the emotional attachment to familiar technologies sometimes made it difficult for participants to transition to newer, more advanced tools. This hesitation to adopt new technology has been identified in previous studies, which suggest that emotional bonding with existing devices can act as both a motivator and a barrier to technological adaptation (Sajjad & Ismail, 2024; Tyron et al., 2024).

A notable challenge reported by participants was technological overwhelm, particularly in response to rapid advancements in assistive technology. Some participants expressed feelings of exhaustion and cognitive overload due to the continuous updates and changes in technology, making it difficult to stay proficient in using assistive devices. This finding is consistent with prior research, which has identified the rapid evolution of assistive technologies as a potential source of stress for users (Grigoryeva et al., 2022; Kuzdeuov et al., 2023). Adolescents in this study noted that just as they became comfortable with one technology, a newer version or alternative would emerge, requiring additional learning and adaptation. The sense of being left behind when unable to keep up with new technologies has been previously highlighted as a barrier to long-term assistive technology use (Mankar et al., 2024; Stanley, 2023).

In terms of psychological adaptation and coping strategies, participants described different methods for managing technological challenges. Many relied on trial-and-error learning, seeking technical support, and adjusting their expectations when facing difficulties. These strategies align with findings from previous studies that emphasize the role of resilience and problem-solving in successful assistive technology use (S. et al., 2025; Yuan & Zhou, 2024). Moreover, participants who demonstrated greater resilience in overcoming technological obstacles also reported higher levels of satisfaction with their assistive devices. This supports research suggesting that a proactive approach to problem-solving can mitigate the psychological burden of assistive technology use (Dolzake, 2024; Rastogi & Srivastava, 2024).

The study also found that social support plays a critical role in shaping adolescents' experiences with assistive technologies. Participants who received encouragement and support from parents, peers, and teachers reported greater confidence in using assistive devices. These findings align with research indicating that strong social networks contribute to positive emotional outcomes for visually impaired individuals using assistive technologies (Arifin et al., 2024; Mnyanyi, 2023). However, not all participants had access to sufficient social support. Some noted that their teachers lacked knowledge about assistive technologies, making it difficult to integrate these tools effectively in classroom settings. This supports findings from prior studies emphasizing the need for better training among educators to

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enhance the effectiveness of assistive technology in educational environments (Abdulhakeem et al., 2024; Filetti et al., 2024).

Peer perceptions also influenced participants' experiences, with some adolescents reporting positive social interactions facilitated by assistive technologies, while others felt stigmatized or excluded. These findings are consistent with research that suggests that peer attitudes toward assistive technology use can either encourage or discourage adolescents from fully engaging with their devices (Nazir et al., 2024; Szekely et al., 2025). Some participants described instances in which their peers were curious and supportive, fostering a sense of inclusion. However, others recounted experiences of being treated differently, which contributed to feelings of isolation. This reflects prior research indicating that while assistive technologies can promote social inclusion, they can also be a source of differentiation, affecting adolescents' self-perception and social interactions (Gawande, 2024; Salam, 2025).

The digital divide emerged as another significant factor influencing the emotional and psychological impact of assistive technologies. Some participants had access to the latest AI-driven assistive tools, while others were limited to outdated or less effective technologies due to financial constraints. This disparity has been highlighted in previous research, which argues that unequal access to assistive technologies can exacerbate existing social and educational inequalities among visually impaired individuals (Jannah et al., 2023; Sidiqua, 2022). Participants in this study who lacked access to advanced technologies reported higher levels of frustration and perceived disadvantage in academic and social settings, reinforcing the need for equitable distribution of assistive technology resources (Kuzdeuov et al., 2023; Tyron et al., 2024).

In addition to academic performance, this study found that assistive technologies play a crucial role in identity development among adolescents with visual impairments. Some participants viewed their assistive devices as tools of empowerment, while others struggled with the fear of being defined by their disability. This finding aligns with research on the psychological complexities of technology use among individuals with disabilities, where assistive tools are seen as both enabling and identity-defining (Saini, 2021; Sajjad & Ismail, 2024). The extent to which adolescents embraced their assistive technologies was influenced by their self-perception, social interactions, and prior experiences with accessibility (Dolzake, 2024; Manitsa & Barlow Brown, 2022).

This study has several limitations that should be acknowledged. First, the sample size was relatively small, with 20 participants, which may limit the generalizability of the findings to all adolescents with visual impairments. While theoretical saturation was reached, a larger and more diverse sample may provide a broader range of experiences and insights. Second, the study relied on self-reported data from interviews, which may be influenced by recall bias or social desirability bias. Participants may have provided responses they believed were expected rather than fully reflecting their experiences. Additionally, the study focused exclusively on adolescents, meaning the findings may not be applicable to younger children or adults with visual impairments.

Future research should explore the long-term emotional and psychological impact of assistive technologies on visually impaired individuals beyond adolescence. Longitudinal studies could provide valuable insights into how emotional responses and coping strategies evolve over time. Additionally, comparative studies between different types of assistive technologies, such as AI-driven tools versus traditional assistive devices, could shed light on the relative benefits and challenges of each approach. Future research should also examine the role of cultural and socioeconomic factors in shaping assistive technology experiences, as access and perceptions may vary significantly across different regions and communities.

To enhance the effectiveness of assistive technologies, it is crucial to improve accessibility training for educators, ensuring they are equipped with the necessary knowledge to support visually impaired students. Schools and institutions should provide comprehensive technical support to reduce frustration and anxiety among users. Additionally, developers should prioritize user-friendly designs, minimizing the learning curve and cognitive load associated with new technologies. Finally, efforts should be made to bridge the digital divide by increasing funding and accessibility initiatives, ensuring that all visually impaired adolescents have equal opportunities to benefit from advanced assistive technologies.

Authors' Contributions

Authors contributed equally to this article.

Declaration

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In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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