

Designing an LLM AI-Powered Digital Storytelling Assistant for Inclusive and Authentic Health Narratives

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Many individuals struggle to meet the recommended guidelines of physical activity (PA) despite the benefits. Traditional digital PA interventions rely on fitness tracking and numerical statistics, which may be less effective for individuals with lower health literacy, particularly those from lower socioeconomic status (SES) backgrounds, as they may struggle to interpret these metrics or translate them into actionable steps. Storytelling has emerged as a promising alternative for health behavior change, yet barriers such as privacy concerns, fear of judgment, and limited recognition of unstructured PA persist. To address these challenges, we propose an artificial intelligence (AI)-powered storytelling assistant using large language models (LLMs) to support low-SES individuals in crafting personal PA narratives. Our approach prioritizes co-creation, cultural sensitivity, and bias mitigation to ensure AI serves as a facilitator to health storytelling rather than a content generator. By positioning AI as a collaborative tool, we explore its potential to empower underrepresented communities in sharing their health stories while preserving narrative authenticity, fostering inclusivity, and avoiding the reinforcement of dominant health narratives.

Additional Key Words and Phrases: Digital storytelling, Physical activity promotion, Generative AI, Large language models, Human-AI collaboration, Ethical AI design

1 Introduction

Approximately 80% of U.S. adults and adolescents did not meet the recommended guidelines [30] for physical activity (PA) despite its well-documented benefits, including improved cardiovascular health, better sleep quality, enhanced mood, and weight management [39]. Traditional digital PA interventions primarily rely on quantitative personal informatics tools [12, 24], such as fitness tracking, which often deliver information at an individual level or within close social circles [9, 25]. However, these interventions tend to be less effective among individuals with lower socioeconomic status (SES), possibly due to their heavy reliance on numerical data, which can be inaccessible for those with lower health literacy [40]. In contrast, narrative approaches such as first-person storytelling, where individuals share personal experiences while peers listen and engage, are effective for health promotion [26]. Rooted in social cognitive theory (SCT), health storytelling has been shown to support healthy behavior change, particularly in underrepresented communities and vulnerable populations, by fostering social modeling and engagement [26]. Additionally, Palacios et al. found that storytelling enhances health communication [29]. At the same time, Saksono et al. emphasized that pairing individuals with similar racial backgrounds in digital health storytelling can drive behavioral change, underscoring its significance for underrepresented communities [35].

Despite its promise, storytelling presents challenges like privacy concerns, fear of judgment, and a lack of storytelling experience [31]. Additionally, preliminary research from our group suggests that families from low-SES backgrounds often recognize only structured PA (e.g., running or swimming) while overlooking everyday activities (e.g., catching a bus, cleaning the floor, picking up children) as valid forms of PA. These barriers limit storytelling's potential to promote

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PA, as individuals may hesitate to share their experiences due to fear of judgment, doubts about their stories' validity, or the belief that they are not "physically active enough" to contribute. Additionally, not recognizing daily activities as meaningful PA discourages sharing everyday experiences, reducing opportunities for social modeling and weakening storytelling's impact on behavior change.

To address these challenges, we propose a digital storytelling assistant powered by artificial intelligence (AI), such as large language models (LLMs), to guide users in crafting impactful PA stories. LLM AI is a promising solution because it can provide real-time, personalized guidance, helping individuals structure their narratives while lowering the cognitive burden associated with storytelling. Additionally, its adaptive capabilities allow it to tailor feedback to users' linguistic and cultural backgrounds, making storytelling more accessible and engaging for low-SES communities. Therefore, informed by our preliminary research and prior literature, we propose that digital storytelling assistants should preserve the authenticity of users' voices [4, 17, 22], minimize overreliance on AI [3, 20], and respect cultural diversity rather than reinforcing dominant health narratives that may not align with the lived experiences of lower-SES communities.

Our research aligns with the workshop's focus on interactive generative AI by exploring how AI can support human storytelling while preserving authenticity and cultural diversity. By positioning AI as a co-creative tool rather than a content generator, we examine its role in human-AI collaboration, bias mitigation, and ethical storytelling for health promotion. Our work engages with key workshop themes, including the emerging capabilities of generative AI, its role in human-AI co-creation, and ethical considerations such as bias and representation. Through this, we contribute to broader discussions on designing AI systems that empower rather than marginalize underrepresented communities.

2 Related Work

The power of storytelling to amplify voices is well-documented, particularly in its role in health professions and healthcare education, improving health outcomes among older adults and promoting health in vulnerable populations [15, 26, 28, 37]. Saksono et al. developed a storytelling tool based on self-determination theory to encourage PA in low-SES families, demonstrating its potential to foster relatedness and motivation in promoting healthy behavior change [33]. Additionally, storytelling has been integrated into fitness-tracking tools to support self-modeling and social modeling, two key processes in social cognitive theory, which can further promote PA among low-SES individuals [34]. Moreover, collective online storytelling has been shown to enhance engagement in social movements by shifting participants' cognitive and emotional perspectives on shared experiences [11]. Plus, Grimes et al. demonstrated that emotive and culturally relevant stories can help low-income African American families adopt healthier dietary habits [16].

However, the potential of digital health storytelling is curbed by personal and social barriers. At the personal level, there are privacy concerns and a lack of storytelling experience [31]. Our preliminary study also suggests social barriers to digital health storytelling, specifically fear of judgment when telling stories and misconceptions about PA that failed to recognize unstructured PA as a valid form of PA. These two-level barriers continue to pose challenges for low-SES communities in sharing their health stories that offer community-relevant healthy practices.

To address these challenges, we propose investigating whether an LLM AI chatbot can be an assistive tool to help low-SES individuals craft more effective PA stories. For example, the storytelling assistant could help users structure their narratives by prompting them to expand on their experiences, such as specifying the activity, providing contextual details, expressing emotions, and highlighting aspects valued by their community. It could also help users recognize everyday activities as meaningful by offering culturally tailored examples. However, the use of LLM also presents a set of challenges.

First is the problem of overreliance. Prior research on AI-assisted writing tools has shown that incorporating AI into tasks such as personal journaling and predictive text generation often leads to increased user reliance on AI-generated content, as these systems directly suggest words, phrases, or even full narratives based on user input [3, 20]. Second is the problem of inauthenticity and cultural insensitivity. Personal voice and authenticity are crucial elements in storytelling [4, 17, 22]. Furthermore, research on AI-assisted writing companions highlights the importance of aligning AI-generated content with users' personal values and creative strategies, as misalignment can undermine ownership, trust, and engagement [7]. Writers view storytelling as deeply personal, resisting AI suggestions that conflict with their vision or impose rigid structures. Biermann et al. found that users are more receptive to AI when it enhances their creative flow rather than dictating content [7]. Similarly, studies exploring conversational agents for documenting digital stories on housing insecurity acknowledge AI tools' potential benefits while raising concerns about machine biases, loss of human connection, and the risk of automating deeply personal narratives in ways that diminish their authenticity and meaning [19]. Specifically, Halperin et al. [19] found that participants felt AI lacked the empathy needed to fully capture their lived experiences, as it automated rather than fostered human connection. Some participants described AI-generated responses as impersonal and overly structured, making their narratives feel transactional rather than deeply meaningful. These challenges highlight the need for AI systems that not only assist in storytelling but also preserve users' autonomy, cultural authenticity, and emotional depth.

However, developing an LLM storytelling assistant is further complicated by biases embedded in LLM training data. Research has shown that LLM training data exhibit notable biases, including regional and cultural biases and gender stereotypes [1, 23, 42]. For example, due to the imbalanced nature of training datasets, some LLMs disproportionately associate certain occupations with specific genders, reinforcing stereotypes up to 3-6 times more than expected [23].

As a result, if not carefully designed, an LLM-powered storytelling assistant could unintentionally reinforce dominant narratives. In turn, these limitations hinder people's ability to tell authentic and culturally sensitive stories. Individuals from low-SES backgrounds who are already underrepresented in training datasets may find their personal and cultural identities diminished or misrepresented by LLM storytelling assistants. For example, the storytelling assistant might default to Western narrative structures, erasing the community's oral traditions and ways of understanding health, such as stories that emphasize ancestral wisdom or spiritual connections to movement and well-being. Additionally, it might praise structured exercises like jogging while overlooking daily activities such as picking up children from school, dancing at community gatherings, or carrying heavy groceries—actions deeply embedded in the user's lived experience. This could exacerbate existing inequalities, further marginalizing vulnerable communities instead of empowering them.

Thus, AI assistants should support digital health storytelling while preserving authenticity, ensuring cultural sensitivity, and minimizing bias, ultimately fostering inclusive and empowering digital health narratives.

3 Designing An LLM-AI Storytelling Assistant

To develop the LLM-AI storytelling assistant that reduces overreliance, inauthenticity, and cultural insensitivity, we echo prior work that suggests technology researchers and designers co-design the LLM storytelling assistant with low-SES community members, drawing on best practices for co-designing conversational agents [32]. Such co-design activities will integrate conversational flow design, role-playing, and value-sensitive design methodologies, using envisioning cards to surface and incorporate stakeholders' values [13] into the system's development. This participatory approach ensures that community voices guide the design process, helping to create an AI system that is culturally sensitive and responsive to user needs.

A major challenge to cultural sensitivity in designing such a system is the potential for AI-generated suggestions to reshape narratives in ways that reinforce dominant health perspectives, thereby erasing or distorting the lived experiences of marginalized communities. While there is a value in shifting community beliefs about what constitutes physical activity (i.e., that catching a bus, cleaning the floor, and picking up children counts as meaningful physical activity), improper value shifting can impose external interpretations of health in a didactic manner, rather than creating opportunities for individuals to develop their own understanding through reflection. Simply instilling health beliefs or prescribing what people should do is ineffective, as health beliefs are deeply embedded in everyday experiences, cultural norms, and social contexts [6, 21].

Therefore, to meaningfully and positively shift people's health beliefs, AI should engage users in reflection and dialogue rather than presenting them with prescriptive statements that may feel disconnected from their reality. Additionally, facilitating storytelling rather than dictating what users should tell helps ensure that users' personal narratives reflect their authentic voices rather than being subtly molded into predefined "ideal" health stories. However, existing approaches to mitigating overreliance on assistive tools like AI, such as cognitive forcing functions [8], providing explanations for AI predictions [38], and metacognition [14], may be less effective for open-ended tasks like digital health storytelling.

Cognitive forcing functions, which prompt users to critically evaluate AI-generated content and provide explanations for AI predictions to reduce cognitive biases, may be effective in structured decision-making tasks, such as clinical decision-making [10]. However, these methods may be less useful in helping users refine deeply personal and creative narratives, where there are no objectively correct choices to assess. Similarly, metacognitive strategies, which encourage users to reflect on their thought processes, can be difficult to apply in storytelling, where narratives are shaped by personal experiences, cultural context, and individual interpretation rather than fixed criteria, making techniques like planning and problem-solving less applicable.

This highlights the need for alternative approaches that support user autonomy while preserving linguistic and cultural diversity. Rather than imposing a singular health narrative that users might over-rely on, LLM prompts should be designed in collaboration with community members to support varied and culturally relevant storytelling styles while respecting individual autonomy. We further argue that community collaboration should go beyond one-way consultation to facilitate mutual learning, where researchers and community members build each other's capacities to address shared challenges. Following Community-Based Participatory Research (CBPR) principles, such an approach can support co-design and empower communities, helping marginalized groups reclaim capacities to counter systemic barriers [36]. Meanwhile, we advocate for an asset-based approach to community collaboration, which centers users' existing knowledge, strengths, and capacities in the design process. This approach fosters long-term impact more effectively than models focusing solely on users' needs [41].

Another critical cultural insensitivity concern is due to bias in AI-generated feedback. If standardized AI-driven suggestions favor mainstream linguistic patterns and cultural norms, they risk erasing individual storytelling styles and reducing narrative diversity. For instance, Gupta et al. show that LLMs are biased in natural language understanding and perform better in Standard American English tasks than African American Vernacular English-translated versions [18]. This issue could lead to stories that, while technically coherent, fail to capture the full depth of users' lived experiences. To mitigate this, the design of future AI systems should act solely as a supportive assistant, providing flexible scaffolding rather than functioning as a story writer or content generator. It should not prescribe what makes a compelling or well-structured story, nor should it enforce a predefined storytelling framework. Instead, the system must

adapt dynamically to different cultural contexts, helping users retain their personal voice while receiving guidance that enhances storytelling without distorting its authenticity.

To further safeguard against cultural biases in data analysis, it is essential to collaborate with researchers from similar cultural backgrounds and active community members who are not merely observers but functionally embedded within the community [2]. This ensures the system’s recommendations align with users’ lived realities rather than reinforcing external assumptions. Embedding human-centered design principles [5, 27] throughout the development process is essential for creating AI storytelling assistants that empower low-SES individuals to share their health narratives authentically and confidently without the risk of misrepresentation or marginalization.

4 Conclusion

This work explores the opportunities and challenges of designing an LLM AI-powered storytelling assistant to help individuals craft health narratives that promote PA in low-SES communities. Our approach aims to address health literacy barriers, respect privacy concerns, and broaden the recognition of unstructured PA. By positioning AI as a facilitator rather than a content generator, we emphasize the need for co-creation, cultural sensitivity, and bias mitigation to ensure inclusive and authentic storytelling.

We stress the importance of preserving personal voice, preventing overreliance on AI, and fostering reflection rather than imposing predefined health narratives. A community-driven, human-centered design approach is essential to empower individuals to share stories that resonate with their lived experiences.

This work contributes to broader discussions on ethical AI in digital health, advocating for AI systems that amplify rather than diminish the autonomy and voices of underrepresented communities. Future research should further explore participatory AI design approaches that prioritize user autonomy, cultural diversity, and long-term community engagement.

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