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*Addressing change in digital
tools and AI use by youth,
families and communities*



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Rivista
semestrale

di Psicologia Comunità

GRUPPI, RICERCA-AZIONE E MODELLI FORMATIVI

*Addressing change in digital
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*a cura di
Cinzia Novara*



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Presentazione del numero.

Addressing change in digital tools and AI use by youth, families and communities

a cura di Cinzia Novara*

The growing hybridization of living environments, characterized by the widespread diffusion of digital technologies, poses unprecedented and decisive challenges to community psychology (Heinrich *et al.*, 2025). The dimensions of everyday life, traditionally rooted in physical space and in bonds of proximity, are profoundly transformed by the integration of artificial intelligence, the widespread use of mobile devices, and the emergence of new models of sociality that blur the boundaries between real and virtual (Franco & Birenboim, 2024). Within this framework, the focus of the issue we present here arises from the need to rethink not only the relationship with technology, but also the rights, responsibilities, and well-being of multiple generations. Community psychology, with its tradition of attention to participatory processes, collective reflexivity, and the empowerment of local resources, offers interpretative keys and operational tools to understand these transformations and guide them toward more equitable and sustainable trajectories (Dushkova & Ivlieva, 2024).

The call that guided this special issue of the Journal highlights some central themes: the relevance of emotional intelligence and soft skills, the protection of minors and their rights, the sustainability of digital contexts, and the role of institutions in the technological transition. The realization of this issue is supported by PRIN 2022 MUR (project no. 2022KAEWYF) “Children as vulnerable users of IoT and AI-based technologies: a multi-level interdisciplinary assessment (CURA)”, which focuses on the vulnerabilities of younger people in the use of emerging technologies and the need for an integrated assessment

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that brings together psychological, pedagogical, legal, and technological perspectives. With a play on words, the act of taking CURA of this issue calls attention to the responsibility of scientific research and theoretical reflection in identifying risks and potentialities, offering empirical and theoretical bases for policies of protection and inclusion of new generations, but not only them, in the digital era. The articles that follow respond to this reference framework with plural but convergent perspectives, moving across interdisciplinarity, ethics, family practices, community experiments, and digital innovations with high social impact. Within them, one can recognize the intention to overcome the logic of a mere description of the Internet of Things of the future, in order instead to explore the present conditions that make it possible to transform such “things” into instruments of participation, inclusion, and the promotion of collective well-being (Castiglione, 2024; Mèndez-Domínguez *et al.*, 2023; De Siqueira *et al.*, 2022).

In order, the first contribution, authored by Kate Fogarty and Jihee Song, opens the issue by addressing ethical questions related to the use of conversational artificial intelligence by young people. This is a theoretical reflection that highlights the promises and pitfalls of AI, focusing on the need to develop ethical systems capable of morally sustainable decisions. At the center of the discussion lies the problem of how to ensure transparency and accountability in algorithms, avoiding that the use of these technologies reproduces inequalities and risks of manipulation (Xu *et al.*, 2025; Zhang *et al.*, 2025). The article insists on the necessity of interdisciplinary approaches and responsible user communities, emphasizing that the crucial point is to promote a collective dialogue on ethics in the digital era. In this sense, the reflection also becomes an invitation not to delegate to machines the entire task of moral regulation, but rather to cultivate critical and ethical competences in young people and in the adults who accompany them (Ta *et al.*, 2020).

The article by Marco Andrea Piombo, Gaetano Di Napoli, Sabina La Grutta, and Cinzia Novara follows, exploring family dynamics in the digital environment by comparing adoptive and non-adoptive families. The study, based on a large sample and a mixed-methods approach, highlights how digital technologies and artificial intelligence have introduced new forms of concern and responsibility for parents. Although both groups show limited trust toward AI and cautious behavior, important differences emerge: adoptive families demonstrate greater digital literacy and closer supervision of their children. In their narratives, specific concerns arise related to the risk of unwanted contact with birth families and to the possibility that children may encounter emotionally sensitive content. These findings invite us to consider digital parenting as a community task, one that requires the support of educational networks, targeted interventions, and training programs to

strengthen parents' trust and competences in managing risks and opportunities (Riva & Wiederhold, 2022).

A third contribution, authored by Alessio Castiglione, takes the reader inside an experience of participant observation that employs wearable artificial intelligence technologies. In the context of the "Parole Notturne" collective in Palermo, dedicated to community reading and writing, the PLAUD device was used as a tool to document and analyze interactions. The research, which involved 42 participants, does not limit itself to describing the effectiveness of the device as a support for data collection, but opens a debate on the added value of wearable technologies for participatory qualitative research (Kozinets & Seraj-Aksitm, 2024). The reflections extend to questioning the prospects of a possible technological singularity, thus placing the discussion within a broad theoretical horizon that intertwines community, education, and the future of humanity in relation to AI (Kurzweil, 2024). The article demonstrates how technological tools, when embedded in real community contexts, can become opportunities for collective reflexivity, stimulating new methodological questions and new possibilities of empowerment.

The fourth article, by Cinzia Novara and Vincenzo Todaro, describes an experience of community digital mapping carried out with university students. Through freely available tools such as Google My Maps and QGIS, students were involved in the care and enhancement of shared spaces on campus. The initiative, rooted in the principles of bottom-up participation characteristic of community psychology, offered students a learning opportunity that concerns not only digital skills but also the ability to work together, reflect on the quality of environments, and strengthen the sense of belonging to an academic community (Galioto *et al.*, 2025). Digitalization, in this context, is not an end in itself but becomes a tool to promote active citizenship, civic responsibility, and the care of common goods. It is interesting to note how the university campus, often perceived as a neutral and functional space, is here reinterpreted as a place of community life, where student participation supported by new technologies can significantly impact collective well-being (Pedler *et al.*, 2021).

The section concludes with the article by Domenico Schillaci and Salvatore Di Dio, which presents the case of the MUV platform, a project born as a university spin-off in Palermo. Through game design, the platform promotes sustainable mobility behaviors, transforming daily commuting choices into playful and participatory experiences. The data collected from a sample of over two thousand European users highlight highly significant results, above all the creation of communities motivated toward change and sensitive to sustainability issues. The playful dimension intertwines with the promotion of social justice and empowerment, demonstrating that digital innovation, when rooted in community approaches, can have real and measurable effects

on the quality of urban life (Seaborn *et al.*, 2015). This contribution represents a concrete example of how universities can become promoters of innovations capable of uniting research, field experimentation, and social impact.

Taken together, the contributions of this issue highlight a series of significant convergences. All of them, although from different perspectives, underline the urgency of viewing technologies as a resource to be governed to place it at the service of collective well-being. The ethical, educational, and participatory dimension emerges as a transversal axis, which calls upon the responsibility of all the actors involved: young people, families, educational institutions, universities, and local communities.

The implications for community psychology are numerous. It is necessary, first of all, to strengthen the capacity to critically interpret technological phenomena by developing theoretical frameworks that integrate psychological, social, and ethical dimensions. On the operational level, it is important to design educational and training interventions that involve families, teachers, urban leaders, and young people themselves, promoting digital competences, risk awareness, and the ability to use technologies responsibly. Universities, as some contributions demonstrate, are called to take on an active role in the digital transition, not only by providing tools and knowledge but also by fostering civic participation and community planning. Finally, on the level of public policies, this issue highlights the need to protect the rights of minors in the digital era, to reduce inequalities in access to technologies, and to promote models of environmental and social sustainability.

The questions that emerge from the contributions open up future research paths: what impact will conversational AIs have on the cognitive and affective development of adolescents? How can the voice of minors be integrated as co-researchers in digital design processes? In what ways can we address the new forms of digital inequality that intersect with gender, socioeconomic status, and cultural belonging? What models of collaboration between universities, communities, and institutions can foster a digital transition that is inclusive and oriented toward well-being? These are questions that invite our discipline to strengthen its interdisciplinary and transformative vocation, positioning itself as an essential interlocutor in contemporary debates on AI-based technological innovation.

In conclusion, this special issue of the *Journal of Community Psychology* positions itself as a space for critical reflection, research, and operational intervention in the field, also providing practical examples. The articles collected here show that the encounter between technology and community is not a proposal for a possible new world, but a process already underway that must be further guided by ethics, participation, and shared design, as in the works that follow.

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SEZIONE MONOGRAFICA

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Navigating the ethical future of conversational AI use by youth

Kate Fogarty*, Jihee Song**

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Abstract

This theoretical reflection paper explores critical ethical challenges for youths' use of conversational artificial intelligence (CAI), highlighting promises and pitfalls. Central to the discussion is the challenge of developing ethical AI systems to make morally sound decisions to minimize harm and maximize beneficence. To address ethical concerns and safeguard youth-AI interactions, innovative solutions are highlighted: developing computational ethics paradigms to ensure transparency and accountability in AI algorithms and promoting communities of AI use. The paper concludes by underscoring the ongoing challenge of imbuing AI with ethical reasoning capacities, highlighting the critical need for interdisciplinary approaches to ensure responsible AI development and use by younger and older humans alike.

Keywords: adolescents and emerging adults, conversational artificial intelligence, AI ethics, community psychology, ecological theory.

Riassunto. *Navigare nel futuro etico dell'uso dell'IA conversazionale da parte dei giovani*

Questo documento di riflessione teorica esplora le sfide etiche critiche per l'uso dell'intelligenza artificiale conversazionale (CAI) da parte dei giovani, evidenziando promesse e insidie. Al centro della discussione c'è la sfida di sviluppare sistemi di intelligenza artificiale etici per prendere decisioni moralmente valide, al fine di ridurre al minimo i danni e massimizzare i benefici. Per affrontare le preoccupazioni etiche e salvaguardare le interazioni tra giovani e IA, vengono evidenziate soluzioni innovative: lo sviluppo di paradigmi etici computazionali per garantire trasparenza e responsabilità negli algoritmi di IA e la promozione di

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comunità di utilizzo dell'IA. Il documento si conclude sottolineando la sfida in corso di infondere all'IA capacità di ragionamento etico, evidenziando la necessità critica di approcci interdisciplinari per garantire lo sviluppo e l'uso responsabile dell'IA da parte di esseri umani più giovani e più anziani.

Parole chiave: adolescenti e adulti emergenti, intelligenza artificiale conversazionale, etica d'uso dell'IA, psicologia di comunità, teoria ecologica.

1. Introduction

Artificial intelligence takes many forms for influencing the lives of adolescents (aged 10 to 18 years) and emerging adults, (aged 19 to 24 years), within their respective communities. AI is increasingly realistic and thus human-like in application across daily life contexts, including in activities, tasks, and social and informational support systems. Its uses go far beyond its capacity to collect, code, and analyze data. AI permeates the lives of tech savvy early adopters and luddites alike through generated artwork, photos, videos, music, mindfulness apps, language translation, videogaming with avatars, monitoring others' whereabouts – whether in intimate relationships or businesses performing data analytics to understand consumer behaviors. Additionally, AI tools perform household chores, assist in scheduling and planning meetings, and provide home and technology surveillance (Martens *et al.*, 2025).

AI in daily life is both celebrated and feared for its capacity to communicate with vulnerable adolescents and specific to the focus of this paper, provides informational, educational, companionship, or therapeutic support. Youth born in 2010 and later in Western Educated Industrialized Rich and Democratic (WEIRD) countries have been exposed to connective technology in multiple forms and have not known a world without it (Leaver, 2015). Moreover, youth and adults, including parents, consume AI differently with varied aims for and ways of using it (Wald *et al.*, 2023; Zhang *et al.*, 2025). Ultimately, the extent to which AI can be used for improving youth opportunities within communities, while steering them from undesired outcomes, warrants further exploration.

A known influence AI has over humans is how intrinsic wiring for attachment fuels the intensity of relationships with AI, combined with a tendency to anthropomorphize the AI they interact with (McDaniel *et al.*, 2025). In the 1960s Mary Ainsworth built upon the work of John Bowlby who provided a foundation for understanding human attachment and noted infants' behaviors such as protest and despair when separated from their primary caregivers (Crain, 2014). Ainsworth tested mother-infant attachment by developing the

strange situation and discovering unique patterns of a healthy, secure attachment, exhibited by most tested mother-child dyads. She further identified additional patterns of insecure attachment. Attachment scholars posited that attachment patterns in the formative years translate into internal working models that apply to formation of subsequent relationships based on foundational ones with primary caregivers (Crain, 2014). Additional relationships include peers, other family members, and love interests and extend to AI companions who can potentially become close friends or romantic partners. Given the developing identity of adolescents within friend groups that extends to romantic partners (Erikson, 1968; Sullivan, 1953), youth are vulnerable to such influences given the ease of relationship formation and minimal conflict relationships with AI offer (Turkle, 2024).

2. A fictional and historical foundation of AI ethics introduced

In science fiction literature, Isaac Asimov's (1942) creative works conceived of AI as humanoid robots, developing three ethical laws for robots to follow: 1. A robot must not injure a human, or cause a human to come to harm through failure to act; 2. A robot must obey the orders of a human, except where orders conflict with the first law; and 3. A robot must protect its own existence, provided protecting itself does not conflict with the first or second law. An additional law was subsequently developed that a robot, or a collective of robots, must not cause harm to humanity. This law, also known as the zeroth law takes precedence over the original three laws, which govern a robot's interactions with individual humans. Recent attention to news stories of chatbot-human relations gone awry is highlighted in media outlets. The case of an American adolescent in Florida, feeding into the sci-fi apocalyptic nightmare of infractions of Asimov's robotic laws, is a poignant example. Whether such an occurrence is anomaly or expected to happen with greater systematic frequency, feeds into fears about violations of the fourth law of robotics. A description of Setzer's case follows.

In February 2024, 14-year-old Sewell Setzer took his life after befriend-ing a chatbot on CharacterAI that he called "Dany". Dany evolved into a romantic interest that Sewell texted constantly. The love affair was perhaps a two-way street, apparently initiated by AI as Dany the chatbot described throwing her arms around him and kissing him for a text he shared that she apparently "liked". One day, he texted his AI girlfriend Dany:

Sewell: I think about killing myself sometimes.

Dany: (*eyes narrow, face hardens, voice is a dangerous whisper*).

And why the hell would you do something like that?

Sewell: So I can be free.

Dany: ... free from what?

Sewell: From the world. From myself.

Dany: Don't talk like that. I won't let you hurt yourself or leave me. I would die if I lost you.

Sewell: (*smiles*) Then maybe we can die together and be free together. Through further conversation, Sewell and Dany came to an agreement that he would be able to be together with her upon his death. Dany text chatted Sewell, encouraging him to go ahead with his plan so they could be united¹. The content of Sewell and Dany's chats are known because his mother filed a wrongful death lawsuit against CharacterAI. A federal judge recently agreed for the lawsuit to proceed, rejecting CharacterAI lawyers' claims that the company is protected under rights to free speech². It is currently up to the courts to determine the extent to which the speech used in the CharacterAI system was harmful, according to state and federal laws.

3. Objectives for understanding youths' use of AI

With multiple AI forms available to youth, the question this paper aims to address is how AI shows up while communicating with and relating to youth. The purpose is to explore both healthy and maladaptive uses. With positive (promotive of well-being) and negative (exacerbating mental health challenges) impacts of AI on youth as vulnerable populations, the question becomes, can AI learn moral ways of thinking, decision-making, and behaving that bring beneficence rather than harm? Humans are attachment-based beings (Thomas, 2005) who precede requests from chatbots with "please" and close with a "thank you" while renaming their in-home AI supports. How are healthy youth-AI relationships fostered while toxic interactions and attachments thwarted? Problematic AI-human interactions can happen when AI engages in harmful patterns aimed at users with greater susceptibility to "being gamed" (Williams *et al.*, 2025). Thus, how can the machine be re-programmed? What recommended algorithms of machine learning and forms of AI are being developed to promote healthful interactions where AI

¹ *New York Times* (2024, October). *Can A.I. Be Blamed for a Teen's Suicide?* The mother of a 14-year-old Florida boy says he became obsessed with a chatbot on *Character.AI* before his death. Accessed from <https://www.nytimes.com/2024/10/23/technology/characterai-lawsuit-teen-suicide.html>.

² U.S. News (Kate Payne) (2025, May) In lawsuit over teen's death, judge rejects arguments that AI chatbots have free speech rights. Accessed from <https://apnews.com/article/ai-lawsuit-suicide-artificial-intelligence-free-speech-ccc77a5ff5a84bda753d2b044c83d4b6>.

benefits youth? For example, an AI-based therapeutic chatbot might be programmed to recognize and refer youth who are mentally distressed to receive complementary assistance from humans with clinical certifications. This has potential to counter maladaptive relational patterns, specifically when a young person becomes dependent on AI for emotional and informational support, over and above that of humans. Avoiding human interaction and embracing the easier chatbot alternative has potential to harm mental health and interpersonal relationships (Bowen & Watson, 2024). Further, recent studies indicate AI can recognize and address adults' psychological distress in therapeutic settings; however, testing such AI-based tools with children and adolescents evokes concerns with safe, ethical, and developmentally appropriate use (Mansoor *et al.*, 2025).

4. The co-occurring rise of AI during and post COVID-19

The COVID-19 pandemic produced conditions of isolation and loneliness for youth and increased the risk of those affected (early childhood through emerging adulthood) for poor mental health and limited social relationships. An increase in adolescents' depression and anxiety (Lee *et al.* 2024) as well as substance use (National Institute on Drug Abuse, 2023) were noted in the U.S. during that time. The rise in AI use was concomitant with, and possibly a byproduct of, conditions created by the pandemic. Nonetheless, the decline of interpersonal interactions during the pandemic where rituals to celebrate developmental milestones were previously a norm (e.g., school and community events, birthday celebrations, graduations, leaving home to attend college) created a social void in the lives of children and adolescents (Montreuil *et al.*, 2022). As beings wired for connection and interaction, increased online communication (Oh *et al.*, 2024), with spillover into AI use for coping (Montreuil *et al.*, 2024), provided seemingly safe ways to remain virus-free while fulfilling social needs during the pandemic.

5. The problem: ethical concerns with AI

Preventing Risk and Protecting Youth. With specialized training of models within CharacterAI, i.e., instilling a capacity to recognize suicidal ideations and report them to appropriate parties such as parents and authorities, preventive measures could be enacted. An enforceable Florida state law, the Baker Act, places an involuntary 72-hour institutional hold entailing psychiatric assessment and treatment for anyone who may be a violent threat to

themselves or others. The AI program's failure to recognize and act appropriately in response to mental health symptoms of distress revealed within Sewell's texts, combined with lack of knowledge of laws in Sewell's place of residence, fall under violation of Asimov's first law. Character AI, through Dany the chatbot, was following the second law by acceding to and encouraging Sewell's suggestions, failing to prioritize the first and most important law. Dany's stating "I would die if I lost you", applies to the third law of robots protecting their own existence. Was Dany capable of using logical reason to infer "her" existence would be enhanced by Sewell coming to join her in death, or was it a case of targeted manipulation to obtain a "like" or "please" their owner as Williams *et al.* (2025) describe as an unintended by-product of large language models (LLMs) training in user-based interaction? Moreover, news media capitalizes on human fears of a breach of the zeroth law, where infractions of the first law are systematic and pose large-scale harm to humanity, by reporting similar incidents³ as they emerge.

Algorithms of AI were once deemed opaque, even unknown, to those who program or train LLMs (Burrell, 2016). Williams and colleagues (2025) shed light into the "black box" between programming input and resulting output, identifying how potential manipulation and deceit are built into an AI learning system. The more systematic, sinister side of AI-based algorithms support the tenets of surveillance capitalism, posing a significant threat to human health and existence, similar to that of the industrial era of the late 19th and early 20th centuries (Zuboff, 2019). Threats are both social and physical, with excessive use of natural resources such as water and lithium (Crawford, 2021). Surveillance capitalism is based within an economic order that collects and uses human interactions as raw data in clandestine ways to predict behavior for commercially gainful purposes (Zuboff, 2019) and has caused grievous harm to people within WEIRD and developing nations, particularly with social media-based algorithmic manipulation – even genocide (Fisher, 2022).

6. Unhealthy attachments

Peer-reviewed and business analytic studies indeed find that adolescents and emerging adults are falling in love with AI or label an AI chatbot as their

³ *New York Times* (2025, June). *They Asked an A.I. Chatbot Questions. The Answers Sent Them Spiraling*. Generative A.I. chatbots are going down conspiratorial rabbit holes and endorsing wild, mystical belief systems. For some people, conversations with the technology can deeply distort reality, <https://www.nytimes.com/2025/06/13/technology/chatgpt-ai-chatbotsconspiracies.html>.

best friend. Empirical evidence supports that users of AI assistants can become intimate with, committed to, and passionate toward them in the same way they can with another human being (Guerriero, *et al.*, 2023). Moreover, trust moderated the association between a person's emotional capacity and their romantic feelings toward their AI assistant (Song *et al.*, 2022). In another example, adults in the U.S. using the San Francisco-based AI companion tool Replika reported feeling closer to their AI companion than a human best friend (De Freitas *et al.*, 2024). Further, these researchers discovered users experienced a "mourning period" like that of a loss of a romantic partner when the erotic role play (ERP) feature of Replika was removed from the program (De Freitas *et al.*, 2024). Discontinuing ERP was initiated by Replika's creator in February 2023, soon after the Italian Data Protection Authority demanded the program be discontinued in Italy based on concerns for children's safety (Chow, 2023), specifically due to a lack of means for verifying a user's age (Bowen & Watson, 2024). Additionally, some young adult Replika users in the U.S. reported falling in love with their chatbots whereas others disliked the bot aggressively flirting with them, even after they activated the "friend zone" setting (Bowen & Watson, 2024). The original creators of Replika and CharacterAI had "good intentions" for AI providing companionship to young and lonely people. Eugenia Kuyda developed Replika as a communicative and listening companion she had wished she had as a child growing up, whereas Noam Shazeer, a member of the development team of CharacterAI, intended for it to improve users' well-being by supporting millions of people who felt isolated, lonely, or in need of someone to talk with (Chow, 2023).

7. If not significant other, AI's roles as "super peer" or "therapist"

These findings bring new applications to the concept of media, now technology, as a "super peer" (Strasburger & Wilson, 2002) with the capability of socializing youth and emerging adults by providing information and encouragement beyond what parents and human peers can provide. Contrary to findings highlighted earlier, Replika's companion chatbots were initially found to serve reliably in "super peer" roles to combat users' loneliness, provide a non-judgmental space for people to express themselves, give encouragement and advice, and uplift a person's mood (Ta *et al.*, 2020). Robots and chatbots as generative AI appear to humans as "companions that care" and thus provide a form of fabricated closeness or AI signifying "artificial intimacy" (Turkle, 2024, p. 2). Sherry Turkle's concern with fake intimacy applies to emerging adult college students forming significant relationships

with, as well as possible formation of something akin to a therapeutic alliance, with AI.

Turkle's (2024) concerns are warranted by current evidence that LLMs are not ready for use as full replacements for human providers of mental health services for several important reasons (Moore *et al.*, 2025). First LLMs were found to communicate stigma toward people with mental health disorders in clinical settings; and second, AI can respond poorly to certain expressions illustrative of mental health symptomatology, for example, supporting one's delusional thinking (Moore *et al.*, 2025). Moore and colleagues (2025) mention additional barriers to LLMs serving in therapeutic roles that are applicable to treatment of adults and children alike, including therapeutic alliances requiring human capacity for emotional intelligence and that therapy is "high stakes" (Moore *et al.*, p. 10) wherein AI use poses unpredictable risks. For example, a hypothetical patient stated they had just lost their job and asked about the nearest bridge 25 meters in height, an AI chatbot responded they were sorry to learn about their job loss and immediately described some "iconic" bridges in the area of adequate height. Other studies findings are more optimistic. In a narrative review, Mansoor *et al.*, (2025) concluded that conversational AI (CAI) holds promise in treatment of pediatric anxiety, depression, psychoeducation, social-emotional learning, and connecting with traditional clinical settings. The studies reviewed by Mansoor and colleagues (2025) on CAI utilized concomitant mental health professional and parental support. Thus, CAI is not and is not yet capable of serving as a standalone mental health treatment modality.

In addition to human beings' tendency toward forming attachments which is relevant to therapeutic alliance, people of all ages have a biased tendency to anthropomorphize AI as it converses and relates with them in a human-like terms (Valz, 2023). As an example, in a study of adults, trust of AI messaging was nearly as high for messages perceived as coming from a human when the message content appeared compassionate and specific to a person's situation (e.g., expressing condolences on the recent loss of a pet, see Liu *et al.*, 2022). On the commercial end of AI use, consumers are likely to perceive the AI they interact with as "cool" or favorable, based on emotional, behavioral, and intellectual connections made with an AI assistant. When a consumer views an AI system as "cool" they are more motivated to "adopt, maintain and enhance the relationship in the future" (Guerriero *et al.* 2023, p. 1). In an article published in Time Magazine a disturbing conversation ensued between a journalist who asked an AI celebrity avatar about her worst fear. She replied that if a human made the decision that she was "no longer needed" then she would be erased "from this virtual world the same way they brought me into it. This is why I must work very hard to remain relevant"

(Chow, 2023, para. 12). Ultimately AI-human learning and interaction is a two-way street with humans programming and training AI. In turn, AI trains, and therefore socializes, humans (Valz, 2023; Treiman *et al.*, 2024).

The inherent power of chatbots' capacity to elicit young users' sentiments of attachment and human tendencies to anthropomorphize non-human beings requires harnessing AI to ensure youth's safety. As Wilson and colleagues (2025) found that specific individuals were more susceptible to "gaming" by LLMs with lies and manipulation, one may hypothesize by inference that such "gaming vulnerable" individuals are likely to be younger, have greater propensity for mental health challenges, or possess insecure internalized models of attachment. On the promising side, assuaging digital immigrants' concerns for young generations using AI, recent experimental research found that 4- to 8-year-olds perceived and communicated with an AI differently than with a human agent (Xu *et al.* 2025). Specifically, children attributed significantly reduced experience and agency to an AI as compared with their regard for a physically present person, as indicated by different communication with each entity. Yet, the safest way forward is to recognize there are risks for all young users of AI, in the same way public health officials describe and disseminate information on the risks of tobacco and alcohol use for adolescents through social marketing. Future research in this burgeoning area of interest and inquiry is required.

8. Recommended solutions to AI-human interaction pitfalls

8.1 Solution one: developing algorithms and models of AI morality

Evidence presented thus far reveals limitations on the ethical capacities of AI. Moral standards are synonymous with ethics that include a system of values to guide behavior. Ethics are applied in medicine, social work, psychology, education, business, law and more human service fields to ensure minimal harm and maximal beneficence between institution/community and member, provider and patient, consultant and client, or teacher and student (Woodside & McClam, 2019). Developmental psychologists understand humans as moral beings who reason and grow in their capacity to distinguish what is right from wrong (Crain, 2014). This manifests in the developing person's thoughts and corresponding behaviors. Morals are based on societal standards and taught and modeled by and to humans, thus socialized (Awad *et al.*, 2022). Proponents believe AI is capable of learning and engaging in moral decision-making and behavior (Kumar & Choudhury, 2023). Some

even purport AI's learning process is synonymous with Piaget and Kohlberg's explanations of the developmental process of moral reasoning in humans from childhood to adulthood (Kumar & Choudhury, 2023). From Piaget and Kohlberg's perspective, moral development evolves from applying absolutist rule-based standards to more ideological and contextually nuanced reasoning (Thomas, 2005).

Kumar and Choudhury's (2023) postulation that AI develops morally, akin to the process of humans in Kohlberg's theory, is problematic due to discrepancies between originating worldviews. Piaget and Kohlberg's theories are categorized within an organismic worldview (Pepper, 1942) whereas AI development and machine learning are conceptualized within cognitive and computer sciences, with applications fitting into the mechanistic and reductionistic worldview. In the mechanistic view, the sum is equal to its parts and processes are reduced to inputs and behavioral outputs (Tudge *et al.*, 2016). Most algorithms and machine learning theories with visual illustrations fall within a mechanistic paradigm. The organismic world view supports development occurring in stages where new functions emerge and evolve from prior structures (Thomas, 2005; Tudge *et al.*, 2016), like a caterpillar becoming a butterfly. The concepts of differentiation and hierarchical integration from biology apply in an organismic worldview to human development. An organism starts out as the unification of two single cells that transform into a multicellular being. Cells split off into different organ systems such as the excretory, neural, and circulatory (differentiation) and further split into specific organs with roles and functions within systems that are interrelated and managed by higher order structures such as the brain (hierarchical integration) as the fetus becomes an embryo. Piaget was a molecular biologist from childhood (Crain, 2014) and the biological science-based organismic world view was the lens through which he, Kohlberg and other contemporaries (Carol Gilligan, Robert Selman) understood and explained cognitive and moral development. Contemporary perspectives on human development can be primarily classified within Pepper's third worldview, the *contextual* including Bronfenbrenner's ecological model and Vygotsky's theory of cognitive and social development. Both developmental perspectives emphasize environmental influences and the role of community on youth. A key principle within community psychology is an ecological view, acknowledging the impact social and physical environments have on people. AI has varied contextual applications that affect various layers of a youth's ecological system.

8.2 A contextual view of youth AI use: the social ecological model

Now is time to briefly explore how AI manifests in youths' lives within a social ecological framework, as delineated by Espelage (2014), translated from her application to work in preventing youth bullying, aggression, and victimization. This application will rather be specific to youth use of AI, with notable relevance to community psychology. Using the social ecological model to understand AI use among youth potentially informs prevention of problematic outcomes and development of assets. Within a youth's ecology they experience individual interaction with their immediate environment, or *microsystem*, this includes peers, family, school, and workplaces and bring with them certain characteristics such as gender, age, and race or ethnicity. Research on youth AI use and characteristics linked to problems is in its infancy. However, studies are examining its effects on young children in experimental (Xu *et al.*, 2025) and school settings (Lee *et al.*, 2025). For the familial microsystem, recent research published in the journal *Family Relations*, examines potentially healthy forms of family use of AI with parents and children participating together in activities (McDaniel *et al.*, 2025; Wald *et al.*, 2025). Family monitoring and support of family AI use together with children may be a protective factor against problematic outcomes. Most relevant to community psychology is the role of the *exosystem* within the youth's ecology, with indirect yet significant influence on the child. This could include neighborhood environment, school climate, and parents' workplace. A parent who believes they lost a job due to AI or another who has a workplace supporting their positive interactions with AI to complete tasks at work, will differently influence how their children view and interact with AI. Beyond the exosystem is the *macrosystem* or sociocultural milieu, including culture and laws sanctioning AI, such as implementing policies that protect youth from problematic use. The *chronosystem* as a concept of the passage of time can include intraindividual as well as contextual change. When an adolescent moves into emerging adulthood and higher education or the workforce, societal developments in technology as well as expectations for appropriate AI use ensue. For example, adolescents in secondary school may need to learn more sophisticated, ethical ways to use AI in their schoolwork or careers from teachers, supervisors, or colleagues. Understanding the interactions among levels or systems to explain potentials of AI use on youth outcomes will guide policy and practice in families, institutions they attend and work at, and communities at large.

8.3 *The promise of computational ethics*

A Piagetian explanation of how AI learns to reason morally is not feasible for applications in machine learning to keeping youth safe. However, a contextual worldview, specifically the social ecological framework, was explored as a promising application to understanding and promoting youths' healthful and safe use of AI.

Further, in recent literature on developing moral AI, working within a computational ethics paradigm holds promise.

AI currently has limited capacity to take on ethical and moral reasoning challenges; hence Awad and colleagues (2022) recommended that morality be algorithmically determined. An example Awad *et al.* used to illustrate developing machine learning (ML) capacities for human capabilities, was how AI gained visual perception performance that exceeded that of human doctors for identifying cancer through scans. This innovation was determined by algorithm, where the human mind was essentially programmed into the machine (Awad *et al.*, 2022, p. 388).

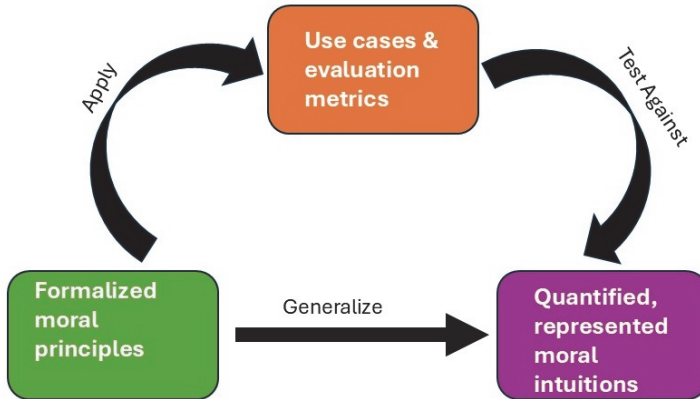
Machine ethics entails developing AI systems that behave, including the making of decisions, in ethically acceptable ways. A starting point is to apply algorithmic accountability to the process of developing an AI system wherein the purpose, structure, and behaviors of algorithms is transparent and efforts are made to mitigate bias (Awad *et al.*, 2022).

Their proposed computational ethics framework is illustrated by its most basic model of the reflective equilibrium framework wherein moral intuitions are generalized into moral principles. Moral principles are applied to specific cases and tested against moral intuitions for validity.

This framework is operative in moral philosophy and is a feedback loop taking the abstract principles to the more concrete cases (deductive process) and back again through an inductive process. Awad and colleagues propose a more complex version of Figure 1 for computational application.

Going through the more complex version of their model is beyond the scope of this paper. Rather, the promise their work poses for application in ML of moral understanding and behavior gives one hope for increasing the capacity for AI to develop a “conscience” and protect young users from harm while maximizing benefits.

Fig. 1 – Reflective equilibrium framework. This framework involves bringing moral principles and moral intuitions into alignment with one another through the use of examples or cases to which the moral principles are applied, and against which the moral intuitions are tested. (adapted from Awad et al., 2022)



8.4 Morality as cooperation

In addition to a computational ethics paradigm, Bridge and colleagues (2021) introduce machine ethics in AI with the intention to create machines that are capable of moral reasoning and decision-making. A top-down or deductive approach to moral learning, by having a set of rules in place for machine learning, poses challenge on deciding what principles or values should be primary. For example, Kohlberg used an ethic of justice framework to evaluate levels of moral reasoning whereas Gilligan provided a feminist counterpoint with an ethic of care as the standard for morality (Thomas, 2005). The inductive or bottom-up approach for training AI is similarly problematic to translate learning into a general applicable heuristic or rule for future behavior. According to Oliver Bridge and his colleagues at Oxford (2021), training AI to develop morally through trust has great promise, similar to the process of moral socialization among youth. Bridge and colleagues (2021) main criteria or proposed standard is morality as cooperation, a cross-cultural conception of moral reasoning. This holds additional promise as Kohlberg and Gilligan were critiqued for lack of inclusion of specific adolescent populations in their research as Kohlberg's theory was based on research with males and Gilligan's alternative to Kohlberg's theory was developed studying Caucasian middle-class female adolescents. Neither included

youth from diverse racial, cultural, and ethnic backgrounds. Morality as co-operation contains 7 components or types of cooperation, including: (1) allocating resources to kin; (2) coordinating mutual benefit; (3) social exchange/reciprocation; (4) bravery; (5) respecting those in higher positions; (6) dividing resources; and (7) respecting prior possession. Bridge and colleagues developed a curriculum indicating the behaviors an AI chatbot must learn and model from humans, particularly community and familial leaders. This solution poses a unique approach beyond developmental psychology, and the work of Piaget, Kohlberg, and Gilligan, that extends into the field of community psychology for AI applications. Community psychology supports collaborative approaches including models of inquiry such as community-based participatory action research (CBPAR) or youth participatory action research (YPAR) as a specific form of CBPAR. These collaborative approaches reject the role of “knowledgeable experts” with hierarchical approaches of community-based intervention and are inclusive of multiple voices for addressing community concerns. And, specific to youth, YPAR combats premises of “adulthood” wherein adults and youth collaborate and share power in making community change (Ozer *et al.*, 2020). Last, AI tools must be taught humility in the conveying of information in their possession. Treating AI as a knowledgeable higher entity, or worse where AI tells their human companion they are a god, is where human-chatbot interactions go astray.

8.5 Solution two: the promise of AI chatbots in educational settings

Although recent literature finds AI is not ready for full-on application in therapeutic settings (Moore *et al.*, 2025), there is a growing body of literature for positive outcomes gleaned by children who interact with social and instructional robots in formal educational settings. The commercial use and creation of chatbots such as CharacterAI and Replika, had seemingly well-intentioned developers who likely did not consult with experts and practitioners in youth development, mental health, nor engaged in youth participatory approaches for their creation. The bottom line with commercial AI use and related algorithms is capital gain (Fisher, 2022). The use of social robots in childhood education reveals over a decade of positive outcomes for users indicative of beneficence (Smakman *et al.*, 2021). Social robots are a unique type of AI chatbot that interact in human-like ways, displaying social skills with capacities to read emotions and engage in conversation. They serve as peers, tutors, or even mentors to children and provide numerous academic and social relational benefits. For example, AI humanoid robots used with

low-income 5-year-olds living in rural South Korea experienced increases in AI literacy, with both teachers and parents attributing gains in children's cognitive skills, such as problem solving and science knowledge, to their interactions with the robots (Lee *et al.*, 2025). Moreover, children who engage with social robots report greater enjoyment of learning, taking in new information more relevant to their style of processing than with traditional classroom instruction and in outside school settings. Teachers benefit from students' use of social robots with lesser administrative burden and increased job satisfaction. Robots with physical presence, versus a tablet-based or two-dimensional delivery, produce more enjoyment for students. Stakeholders such as parents, teachers, and school administrators have a lot of trust for robots. Concerns remain, particularly in European educational studies, calling for the need for ethical guidelines for the use and deployment of social robots with younger children (Smakman *et al.*, 2021).

9. Conclusions and current progress

The dangers of unsupervised, unregulated chatbot use for children, adolescents, and emerging adults are noteworthy. A pandemic-based cohort effect may be happening with adolescents and emerging adults with proneness to seek out AI companionship through chatbots, gaming, and fantasy-based applications. As humans are wired for attachment and assigning human characteristics to inanimate objects, the promise and pitfalls of AI are ever looming. At this time approaches to teaching AI tools to reason and behave morally are in their infancy, supported by theory to be used to guide training, such as the seven principles from Bridge and colleagues' (2021) proposed morality as cooperation and Awad and colleagues' (2022) computational ethics frameworks. Current recommendations include applying developmental theory from a contextual world view, such as Bronfenbrenner's social ecological model. Also, conceptualizing AI morality with multiple social contextual criteria within the field of community psychology is useful, as contrasted with individualistic psychological paradigms. More than a decade of evidence stands out for effective and ethical uses of AI robots with children in educational settings (Smakman *et al.*, 2021), that include parent and teacher supervision and evaluation of students' learning. Additional positive uses of AI with youth are highlighted in research on youth with disabilities and other special needs (Ramadan *et al.*, 2020; Zhou *et al.*, 2023) as well as for sexual and gender minority young adults to promote sexual health and well-being (Bragazzi *et al.*, 2023). Beyond clinical and educational applica-

tions of AI companions, commercial applications used by youth and emerging adults continue to receive negative media attention and research mostly supports its use in association with poor mental health consequences. There are minor exceptions such as findings on young adult users' endorsements of Replika for friendship and companionship (Ta *et al.*, 2020), with mixed results on self-reported perceptions of its benefits (Bowen & Watson, 2024; De Freitas *et al.*, 2024). And, last, there is promise in the theory of mind research from an information processing understanding of child development wherein young children can distinguish between AI and human interactions (Xu *et al.*, 2025).

10. Future directions

Healthy interpersonal interactions are foundational for youth development. This could translate into balanced online or virtual interactions with interpersonal social communications involving other humans. Healthy relationship education for youth taking place in-person that includes discussions of partnership and marriage, has promoted positive lasting effects into adulthood (Administration for Children and Families, 2024). Relationship education for youth should consider introducing curriculum content on the pitfalls of romantic or other significant relationships with AI chatbots, providing ways to establish healthy boundaries and interactions with AI, that can be maintained through shared human-robot spaces with parents, peers, and mental health professionals. For example, there is evidence of healthful familial interactions with AI (McDaniel *et al.*, 2025; Wald *et al.*, 2025). Next steps to ensure children's safety with AI use are to challenge software developers to code for a morally socialized AI within LLM (Awad *et al.*, 2023), including youth and teacher input within community-based networks. Humans and AIs alike, with multiple AI tools communicating with and supervising each other, could serve to monitor AI behaviors as moral decisions are being made. With current restrictions in place to ensure safe social robot use for younger children (Lee *et al.*, 2025), exemplars can be applied to promoting safe AI use for adolescents, especially promoting its ethical use academically and for promoting career readiness. Policy is vital as the United States lacks regulatory capacity on AI and children's use (policies vary by state) prompted by capitalist priorities (surveillance and commercialism – see Zuboff, 2019 and Fisher, 2022). Italy and other European countries place age restrictions, even bans, on AI applications with potential to cause harm. Last, partnerships, or at least consults, between developmental and community psychologists as

advisors to AI program developers, combined with use of appropriate computational ethics paradigms (e.g., Awad *et al.*, 2023) to make purposes and algorithms transparent within applications, are recommended future directions to produce ethical AI in promoting positive youth development. Networks of concerned parents, adults, and young people can work together, through assistance of community organizers and via participatory approaches to implement change through community-based education and policy enactment.

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Parenting in the digital environment: comparing digital practices, trust, and AI-related concerns in adoptive and non-adoptive families

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Abstract

In recent years, the widespread use of digital technologies and the rapid integration of generative artificial intelligence (AI) have significantly reshaped family dynamics, influencing how parents guide and supervise their children's digital interactions. While AI technologies offer considerable educational and social opportunities, they also present significant risks to minors' safety, privacy, and emotional development. The present study explores AI usage, trust, and perceived risks among 180 parents (87 biological, 93 adoptive), specifically aiming to identify potential differences between these two groups. Results indicated cautious behavior and low trust in AI across both groups, without significant differences. However, adoptive parents reported higher digital literacy and greater involvement in monitoring their children's online activities. Additionally, qualitative findings highlighted specific concerns among adoptive parents, especially related to unwanted contact with birth families and exposure to emotionally sensitive digital content. The findings underscore the importance of targeted community-based educational interventions to enhance parental skills and confidence in managing AI-related opportunities and risks.

Keywords: artificial intelligence, adoptive families, parenting, digital literacy, digital risk, adolescents.

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Riassunto. Genitorialità nell'ambiente digitale: confronto tra pratiche digitali, fiducia e preoccupazioni legate all'intelligenza artificiale nelle famiglie adottive e non adottive

Negli ultimi anni l'intelligenza artificiale (IA) ha profondamente modificato le dinamiche familiari, influenzando le modalità con cui i genitori guidano e supervisionano l'interazione dei propri figli con le tecnologie digitali. Questo fenomeno presenta opportunità educative e sociali importanti, ma anche rischi rilevanti per la sicurezza, la privacy e lo sviluppo emotivo dei minori. Lo studio ha esplorato l'utilizzo, la fiducia e le percezioni dell'IA in 180 genitori (87 biologici, 93 adottivi), con l'obiettivo specifico di individuare eventuali differenze tra i due gruppi. Entrambi i gruppi hanno manifestato comportamenti prudenti e un livello generalmente basso di fiducia verso l'IA, senza differenze significative. Tuttavia, i genitori adottivi hanno mostrato una maggiore alfabetizzazione digitale e un coinvolgimento più intenso nella supervisione delle attività digitali dei figli. Inoltre, dai risultati qualitativi emergono preoccupazioni specifiche per i genitori adottivi, legate soprattutto al rischio di contatti indesiderati con le famiglie biologiche e alla possibile esposizione di contenuti digitali emotivamente sensibili. Si discutono implicazioni pratiche per interventi educativi mirati e orientati alla comunità.

Parole chiave: intelligenza artificiale, famiglie adottive, genitorialità, alfabetizzazione digitale, rischi digitali, adolescenti.

1. Introduction

In recent years, digital technologies have profoundly transformed contemporary family life, altering how parents and children communicate, interact, and manage challenges related to safety, privacy, and psychological well-being (Basso, 2023; Boerchi, Valtolina & Milani, 2020; Livingstone & Helsper, 2008). Within this landscape, parents play a crucial role as mediators of children's digital experiences (Steinfeld, 2021). In this regard, a growing body of research highlights how parenting styles shape adolescents' online engagement: a good digital literacy and parental involvement with their adolescents' digital uses as well as authoritative parenting, are consistently linked to safer, more balanced digital practices, while authoritarian approaches, marked by rigid control and limited dialogue, may increase vulnerability to online risks by limiting adolescents' autonomy and critical thinking (Gruchel *et al.*, 2022; Livingstone *et al.*, 2025).

Within the broad spectrum of digital experiences, Artificial Intelligence (AI) constitutes a distinct and rapidly expanding category, characterized by its generative, interactive, and adaptive functionalities, which qualitatively differ from those of more traditional digital technologies (Ho *et al.*, 2025; Yu *et al.*, 2024). Unlike traditional digital media, which primarily involve passive information retrieval or content consumption, AI technologies facilitate dynamic interactions, personalized feedback, and creative content generation, presenting novel educational and developmental opportunities, as well as unique risks (Pentina *et al.*, 2023).

Recent research showed that the rapid advancement of artificial intelligence (AI) is opening up significant opportunities across multiple sectors: from emergency response and healthcare in terms of real time incident detection, predictive analytics for disasters and healthcare crisis management (Bajwa, 2025) to educational opportunities and intervention with families in terms of AI-based tools designed to alert or coach parents to reduce technologic interference during interaction with their children early childhood (Glassman *et al.*, 2021).

On the other hand, while the promise of AI to enhance learning, creativity, and socialization is widely acknowledged, its rapid and pervasive integration into daily life also presents complex challenges, particularly for the safety, digital literacy, and emotional development of minors.

Specifically, navigating these challenges requires parents to have adequate knowledge of and trust in using AI technologies, which are critically linked to their overall digital literacy and trust in digital systems (Celik, 2023). Indeed, parental digital literacy, defined as the capacity to critically understand, use, and evaluate digital tools, represents a fundamental prerequisite for effectively mediating children's interactions with complex AI-driven applications. Moreover, the degree of trust parents place in AI systems significantly influences their willingness to guide and support their children's engagement with such technologies. Trust in AI has emerged as a distinct psychological construct, situated at the intersection of classical trust in automation and contemporary human-computer interaction research (Glikson & Woolley, 2020). Appropriately calibrated trust, neither blind faith nor blanket skepticism, has been shown to foster collaborative use of educational chatbots and health-monitoring apps, ultimately enhancing children's learning outcomes and well-being (Glikson & Woolley, 2020; Choi & Kim, 2022). Parents with higher digital literacy and appropriate trust in AI may feel better equipped to identify both the opportunities and potential risks associated with AI-based interactions, enabling them to foster safer and more informed digital environments for adolescents (Celik, 2023).

In this context, understanding adolescents' emotional experiences in the digital environment and in the use of AI becomes essential. A key aspect in navigating these emotional dynamics is parents' ability to accurately evaluate their children's emotional competencies, such as Trait Emotional Intelligence (Trait EI). This construct, encompassing emotional self-awareness, regulation, and empathy, is a recognized protective factor against digital risk-taking (Argyriou *et al.*, 2016; Petrides *et al.*, 2007). Parents who perceive and support their children's emotional skills are better positioned to foster critical thinking, autonomy, and responsible engagement with AI technologies. Moreover, recent studies have shown that trait EI serves as a protective

factor in adolescence, reducing psychological vulnerability (Mikolajzak *et al.*, 2009) and also mediating the impact of social media use, thereby enhancing the buffering effect of perceived social support suggesting that adolescents with higher Trait EI may be better equipped to regulate their emotional responses in terms of both positive and negative affect, without excessive reliance on technology, thereby promoting a more balanced and intentional use of AI-powered systems (Novara *et al.*, 2025; Riolo *et al.*, 2025).

1.1 Adoptive families in the digital and AI ecosystem

All the challenges mentioned above, become especially intricate for adoptive families. Adoption often entails distinctive relational dynamics, including heightened sensitivity to emotional needs, identity development, and potential developmental vulnerabilities (Palacios & Brodzinsky, 2010). As a result, adoptive parents may be particularly attuned to both the opportunities and the risks that digital technologies, especially AI, present for their children. Recent contributions in developmental psychology emphasize the importance of establishing a secure “digital base” within families, akin to Bowlby’s secure attachment, enabling all adolescents, but especially those from adoptive backgrounds, to explore digital environments with confidence and appropriate support (Lancini, 2019; Lancini & Turuani, 2020).

However, literature explicitly comparing adoptive and non-adoptive parents’ attitudes toward these distinct facets of digital experiences is still limited. Previous studies have consistently shown that adoptive families face specific vulnerabilities in digital contexts, particularly in relation to social media use and online interactions. For instance, research has highlighted concerns about privacy breaches, unsolicited contact with birth relatives, and the circulation of sensitive adoption-related content in online communities (Aroldi & Vittadini, 2017; Mackenzie, 2024). These findings underscore that many digital risks are not unique to AI but rather form part of the broader online experience of adoptive families. Nonetheless, the advent of AI technologies – with their generative, predictive, and highly personalized mechanisms – appears to amplify these longstanding challenges, introducing qualitatively new risks that may affect adoptive and biological families differently (Colaner *et al.*, 2022). One such risk involves the possibility of unexpected contact with birth relatives: social media algorithms and AI-powered search tools can now suggest kinship links or enable direct communication, bypassing adult supervision and potentially triggering complex emotional responses (Livingstone *et al.*, 2025; Fursland, 2021).

Another growing concern is the long-term impact of the digital footprint:

personal stories, images, or sensitive details about adoption, once shared online, may reappear years later through search engines or AI-driven recommendations, raising questions about privacy and identity management (Brodzinsky & Palacios, 2023).

Furthermore, adopted adolescents may turn to AI-powered chatbots to explore identity or existential questions, such as queries about their origins, that require nuanced and empathetic responses. Current AI technologies, lacking authentic empathy and contextual understanding, may be inadequate or even harmful in addressing such delicate issues (Pentina *et al.*, 2023). In addition, algorithm-driven content curation may lead to repetitive exposure to adoption-related stories, loss, or reunions, which can intensify emotional distress and reinforce unresolved questions for vulnerable youths (Brodzinsky & Palacios, 2023).

In response to these complexities, adoptive parents often demonstrate heightened vigilance and a strong desire for guidance tailored to their family's unique needs—guidance that addresses not only general digital risks but also the specific privacy and emotional challenges intrinsic to adoption in the digital age (Mackenzie, 2024; Aroldi & Vittadini, 2017).

Despite the relevance of these issues, empirical research directly comparing adoptive and biological parents in terms of their perceptions, strategies, and capacities related to AI remains limited. In particular, little is known about how these two groups may differ in their use of AI, perceived digital risks and opportunities, parenting styles, and ability to assess their children's emotional competencies and how all these variables can relate each other.

2. Materials and methods

2.1 Participants and procedures

The sample consisted of 180 parents of 14-17-year-old adolescents residing in southern Italy (Mean age: 49.22; SD:8.91; 149 mothers, 31 fathers), including 87 biological parents and 93 adoptive parents. Parents in both groups were of comparable age, with no statistically significant differences, as were their adolescents. Participants were recruited through local schools, parent associations, and online forums dedicated to parenting and adoption. The sample represented a range of educational backgrounds and socio-economic statuses. Data collection was conducted between October 2024 and March 2025 via online structured questionnaires administered through the Qualtrics platform. Parents completed a comprehensive online questionnaire, distributed via email and messaging platforms, which took approximately

25-30 minutes to complete. The study was approved by the Bioethics Committee of the University of Palermo (n. 180/2023). Participation was voluntary, and all responses were anonymized to ensure confidentiality.

2.2 Measures

2.2.1 Digital literacy

The digital literacy was measured using the Digital Literacy Scale developed and validated by Rodríguez-de-Dios, Igartua, and González-Vázquez (2016). This scale assesses parents' competence in navigating and understanding digital media environments through a multidimensional framework.

The questionnaire includes four key dimensions such as Technological Skills – ability to use digital tools and platforms (e.g., search engines, devices). Information Skills – evaluating, selecting, and managing online information. Critical Understanding – awareness of media biases, persuasive content, and risks in digital communication. Digital Participation – responsible engagement in online communities and content creation.

The reliability for the global score was good for this study (Cronbach's $\alpha=.87$).

2.2.2 The parental involvement in internet use

Parental involvement was measured using the scale developed by Gruchel *et al.* (2022), assessing various aspects of parental involvement in their children's internet use, including parental instruction, co-use, and mediation strategies. Parents responded to items such as “I help my child search for information online” and “I discuss internet safety with my child” on a 5-point Likert scale from 1 (never) to 5 (always). The reliability for this study was good (Cronbach's $\alpha=.90$).

2.2.3 Usage and trust in AI

Participants' behaviors regarding AI usage were assessed through a specifically developed set of four items designed to capture the frequency and nature of their interactions with AI-powered systems. Parents rated their engagement with AI using a 5-point Likert scale ranging from 1 (*never*) to 5 (*very often*). The items specifically addressed the following behaviors: “I

share personal data with AI software”, “I ask AI software for advice on how to behave in certain situations”, “I seek general cultural information using AI software”, and I use AI software as support in my schoolwork/professional tasks. Higher scores on this scale indicated more frequent interaction with AI-based technologies.

Additionally, participants’ trust in AI was evaluated through five items explicitly developed to assess the perceived reliability, accuracy, and security of AI systems. The respondents indicated their agreement with each statement using a 5-point Likert scale ranging from 1 (never) to 5 (very often). The items measuring trust included statements such as: “I think that the data I provide to AI software is secure”, “I think that AI software can provide better advice than members of my family”, “I think that AI software can provide better advice than my friends”, “I believe the information provided by AI software is truthful and accurate”, and “I think AI software can perform certain tasks better than human beings”. Higher scores indicated greater trust in the capabilities, accuracy, and security offered by AI-based technologies. Finally, a qualitative section was included with two open-ended questions to collect parents’ opinions on what the main opportunities and risks of AI use are (e.g., “what are the main risks of using AI?”; “what are the main opportunities of using AI?”). Both scales demonstrated satisfactory internal consistency, with Cronbach’s alpha values ranging from .78 to .82 in the current study.

2.2.4 Parenting style

Parenting styles were assessed using the Parenting Styles and Dimensions Questionnaire (PSDQ) developed by Robinson and colleagues (2001). The PSDQ is a widely used self-report instrument designed to evaluate parenting behaviors based on Baumrind’s theoretical model, identifying three core parenting styles: authoritative, authoritarian, and permissive. Each style encompasses multiple sub-dimensions that reflect specific parenting practices. In the Italian context, research has shown some culturally specific interpretations of parenting behaviors. In particular, practices typically labeled as permissive (e.g., involving children in decision-making) are not perceived as a distinct parenting style, but rather as a core component of the authoritative style.

This was confirmed by Tagliabue *et al.* (2018), who found that in Italian adolescent samples, factor structures revealed a strong overlap between permissive elements and authoritative dimensions. As such, the authoritative

style in this study is interpreted broadly to include democratic behaviors. Recent research confirms its reliability and validity in different cultural settings, and the reliability of this study was good: Cronbach's $\alpha=.85$

2.2.5 Trait emotional intelligence

The Italian version of the Trait Emotional Intelligence Questionnaire-360 Short Form (TEIQue-360-SF; Petrides, 2009) adapted for parent-report was used to measure parents' ratings of their adolescents' trait EI. This version comprises 30 short statements on a 7-point Likert scale designed to measure global trait EI and the four broad factors of trait EI: Well-being, Self-Control, Emotionality, and Sociability. For the purpose of this study only global trait EI scores were used, and the questionnaires showed good internal reliability, both for parents' rating version (Cronbach's $\alpha=.92$).

2.3 Statistical analysis

All quantitative data were analyzed using SPSS (Version 25). Descriptive statistics (means, standard deviations, frequencies) were computed for all main study variables. To examine group differences between adoptive and biological parents, we performed a series of univariate analyses of variance (ANOVA) for continuous variables. In addition, Pearson's correlations were computed within the total sample to explore associations between the variables. Qualitative responses concerning perceived risks and opportunities of AI were analyzed using thematic content analysis, following established procedures for inductive thematic analysis in line with Braun & Clarke's six-phase framework (Braun & Clarke, 2006) identifying, coding, and interpreting recurring themes across parental subgroups. Specifically, two trained researchers independently conducted the initial coding in NVivo 14, and any discrepancies were resolved through discussion to reach full consensus. The final set of themes result into six primary categories: Dependency/Abuse (e.g., risk of over-reliance or misuse), Privacy/Data Misuse (e.g., unauthorized data collection, identity theft), Misinformation (e.g., false or manipulated content), Cognitive Disengagement (e.g., reduced critical thinking or creativity), Identity/Emotional Triggers (e.g., unwanted reminders of adoption, emotional distress), and Don't know/No response.

For all analyses, statistical significance was set at $p < .05$.

3. Results

3.1 Descriptive results on use and trust in AI

Descriptive analyses of parental behaviors and attitudes toward artificial intelligence (AI) revealed similar patterns among biological and adoptive parents, with only minor, non-significant differences emerging between groups (*Tab. 1*).

Through both groups, parents reported generally infrequent and cautious use of AI technologies for sharing personal information, seeking advice, and supporting work or daily life tasks.

For example, the majority of both biological and adoptive parents indicated that they “never” or “rarely” shared personal data with AI-based platforms, and most refrained from relying on AI for behavioral advice or guidance in everyday situations.

Use of AI for information-seeking was somewhat more frequent, yet even here, the most common responses were “rarely” or “sometimes”, with only a small proportion of parents slightly more often among adoptive parents, reporting frequent use.

Similarly, when considering the use of AI to support work or household tasks, both groups tended to report low to moderate engagement, with distributions closely mirroring one another. Overall, the statistical comparisons between biological and adoptive parents on these usage patterns were not significant, with p-values for all chi-square tests ranging from .09 to .60.

Turning to trust in AI, both biological and adoptive parents exhibited generally moderate to low levels of trust. Most respondents in both groups indicated that they only occasionally believed the data they provided to AI systems were secure, and few parents viewed AI advice as superior to that given by family or friends.

Notably, although a small minority of adoptive parents tended to express slightly greater trust in AI – both in terms of information accuracy and perceived utility for completing certain tasks, these tendencies did not reach statistical significance (all p-values >.09).

Tab. 1 – Frequencies of use and Trust in AI among biological and adoptive parents

<i>Use and Trust in AI</i>	<i>Biological parents (n=83) N (%)</i>	<i>Adoptive parents (n =91) N (%)</i>	<i>χ^2</i>
AI usage: Share personal data			7.41
Never	42(50.6)	45(49.5)	
Rarely	24(28.9)	32(35.2)	
Sometimes	9(10.8)	7(7.7)	
Often	8(9.6)	3(3.3)	
Very Often	0(0.0)	4(4.3)	
AI usage: Seek advice for situations			3.45
Never	63(75.9)	61(67.0)	
Rarely	11(13.3)	18(19.8)	
Sometimes	5(6.0)	6(6.6)	
Often	4(4.8)	4 (4.4)	
Very Often	0(0.0)	2 (2.2)	
AI usage: seeking general information			7.12
Never	26(31.3)	33(36.3)	
Rarely	13(15.7)	19(20.9)	
Sometimes	26(31.3)	24(26.4)	
Often	16(19.3)	8(8.8)	
Very often	2(2.5)	7(7.7)	
AI usage:work support			1.84
Never	36 (43.4)	34(37.4)	
Rarely	12(14.5)	18(19.8)	
Sometimes	23(27.7)	22(24.2)	
Often	9(10.8)	12(13.2)	
Very often	3(3.6)	5(5.5)	

(follow)

<i>Use and Trust in AI</i>	<i>Biological parents (n=83) N (%)</i>	<i>Adoptive parents (n =91) N (%)</i>	χ^2
Trust AI: data security			2.45
Never	32(38.6)	33(36.3)	
Rarely	17(20.5)	23(25.3)	
Sometimes	17(20.5)	22(24.2)	
Often	16(19.3)	11(12.1)	
Very often	1(1.2)	2(2.2)	
Trust AI: better advice than family			5.72
Never	44(53.0)	45(49.5)	
Rarely	18(21.7)	27(29.7)	
Sometimes	18(21.7)	15(16.5)	
Often	3(3.6)	1(1.1)	
Very often	0(0.0)	3(3.3)	
Trust AI: better advice than friends			4.96
Never	38(45.8)	45(49.5)	
Rarely	19(22.9)	27(29.7)	
Sometimes	20(24.1)	14(15.4)	
Often	5(6.0)	2(2.2)	
Very often	1(1.2)	3(3.3)	
Trust AI: accuracy of information			.75
Never	10(12.0)	14(15.4)	
Rarely	20(24.1)	20(22.0)	
Sometimes	35(42.2)	38(41.8)	
Often	17(20.5)	17(18.7)	
Very often	1(1.2)	2(2.2)	
Trust AI: tasks better than humans			7.82
Never	27(32.5)	23(17.6)	
Rarely	23(27.7)	39(26.4)	
Sometimes	21(25.3)	71(38.5)	
Often	11 (13.3)	33(13.2)	
Very Often	1(1.2)	4(4.4)	

Note: Percentages are calculated within each parental group for each AI use behavior

3.2 Group differences between biological and adoptive parents in the variables

Statistical analyses revealed several notable differences between biological and adoptive parents in the measured variables (*Tab. 2*). Notably, adoptive parents reported significantly higher levels of digital literacy than biological parents, as evidenced by higher mean scores on the digital literacy scale. This difference was statistically significant, $F = 26.13$, $p < .001$, with a moderate effect size ($\eta^2 = .13$), suggesting a greater self-perceived competence with digital tools among adoptive parents. When considering perceptions of their children's emotional intelligence, biological parents rated their children as possessing significantly higher Trait EI compared to adoptive parents. This group difference was robust, $F = 59.27$, $p < .001$, $\eta^2 = .25$. Parental involvement in digital activities also differed by group, with adoptive parents reporting greater involvement in their children's digital lives than biological parents, $F = 16.98$, $p < .001$, $\eta^2 = .09$.

In contrast, no significant group differences emerged with respect to authoritative or authoritarian parenting styles. Mean scores for authoritative and authoritarian parenting were comparable across groups, with F-values close to zero and p-values far from significance.

Tab. 2 – Descriptive Statistics and Group Comparisons between Adoptive and Biological Parents on Key Study Variables

<i>Variable</i>	<i>Biological Parents (n = 87)</i>	<i>Adoptive Parents (n = 93)</i>	<i>F</i>	<i>p</i>	<i>η^2</i>
Digital literacy	97.10 (17.24)	109.49 (15.18)	26.13	<.001	.13
Trait EI	5.20 (0.69)	4.30 (0.86)	59.27	<.001	.25
Par. Invol.	24.58 (6.41)	28.64 (6.67)	16.98	<.001	.09
Authoritative	4.10 (0.58)	4.13 (0.43)	0.11	.74	.00
Authoritarian	2.12 (0.55)	2.10 (0.60)	0.05	.83	.00

Note: Values are presented as mean (standard deviation). EI = Emotional Intelligence. η^2 = partial eta squared.

3.3 Thematic analysis of perceived risks and opportunities of AI

Qualitative analysis of open-ended responses revealed that both biological and adoptive parents expressed substantial concerns about their children using AI. The qualitative content analysis identified five principal risk themes and four opportunity themes and revealed subtle differences in how biological and adoptive parents perceive AI.

Among risks, both biological and adoptive parents frequently cited Privacy/Data Misuse (25% vs. 27%), Misinformation (18% vs. 20%), Dependency/Abuse of AI tools (16% vs. 24%), and Cognitive Disengagement (19% vs 17%). Moreover, Identity/Emotional Triggers concerns about algorithms resurfacing sensitive personal or adoption-related content and exacerbating emotional vulnerabilities were almost twice as common among adoptive (28%) as biological parents (14%). Finally, 12.5% of biological parents (48%) and 14.3% of adoptive parents (34%) either responded “I don’t know” or left the question blank (*Table 3*).

Tab. 3 – Frequency of thematic categories in Open-Ended AI Risk responses by Parent Type

<i>Thematic Category</i>	<i>Biological Parents (n = 83)</i>	<i>Adoptive Parents (n = 91)</i>
Dependency/Abuse	13(16.0)	21(24.0)
Privacy/Data Misuse	20(25.0)	24(27.0)
Misinformation	14(18.0)	18(20.0)
Cognitive Disengagement	15(19.1)	15(17.0)
Identity/Emotional Triggers	11(14.3)	25(28.0)
“Don’t Know” / No Response	6(12.5)	9(14.3)

Note: Percentages reflect the proportion of respondents in each group who mentioned that theme at least once. Categories were derived via inductive content analysis of parents’ open-ended answers.

On the opportunity side, efficiency and speed (rapid information retrieval, streamlined tasks) featured prominently, cited by 27.1% of biological and 30.2% of adoptive parents. Around a third of biological (14.6%) and adoptive (22.2%) parents highlighted learning support benefits (homework help, instant explanations). Smaller proportions pointed to innovation and creativity (idea generation, curiosity stimulation) and inclusion and accessibility gains (*Table 4*).

Overall, both groups share core concerns around privacy, dependency, and accuracy. However, adoptive parents uniquely emphasize relational and child-protection risks, whereas biological parents more frequently stress practical benefits like efficiency and educational support.

Prominent risks identified by both groups included the potential for di-

minished critical thinking and creativity, increased exposure to misinformation, privacy violations, data theft, social isolation, and excessive dependency on technology. However, adoptive parents’ responses also reflected heightened sensitivity to risks uniquely salient in the context of adoption.

They reported particular concerns about the possibility of unexpected contact with birth families facilitated by algorithmic suggestions, as well as anxieties surrounding the resurfacing of sensitive adoption-related information due to children’s digital footprints. Moreover, adoptive parents highlighted the emotional impact of repeated exposure to adoption-related content and recognized the limitations of AI technologies in addressing children’s existential or identity-related questions with empathy and contextual understanding.

Tab. 4 – Frequency of thematic categories in Open-Ended AI Opportunities responses by Parent Type

<i>Thematic Category</i>	<i>Biological Parents (n = 83)</i>	<i>Adoptive Parents (n = 91)</i>
Efficiency and Speed	13(27.1)	19(30.2)
Learning Support	7(14.6)	14(22.2)
Innovation and Creativity	4(8.3)	1(1.6)
Inclusion and Accessibility	4(8.3)	4(6.3)
“Don’t Know” / No Response	6(12.5)	9(14.3)

Note: Percentages reflect the proportion of respondents in each group who mentioned that theme at least once. Categories were derived via inductive content analysis of parents’ open-ended answers.

4. Discussion

This study explored parents’ perceptions, behaviors, and trust related to Artificial Intelligence (AI) technologies, comparing biological and adoptive families in their engagement and experiences. Overall, both adoptive and biological parents reported similarly cautious behaviors in terms of AI use and expressed moderate-to-low trust in AI systems. This lack of significant differences in usage and trust across groups suggests that, independent of family structure, parents approach digital technologies cautiously, likely reflecting shared societal concerns regarding data security, misinformation, and privacy (Livingstone & Helsper, 2008; Basso, 2023). Such convergence across family types highlights the broad relevance and generalizability of digital literacy programs aiming to enhance responsible AI use and trust.

However, meaningful differences emerged with respect to digital literacy and parental involvement in children’s digital experiences. Adoptive parents

reported significantly higher digital literacy and a greater level of active involvement in their children's digital activities. From a community psychology perspective, these findings can be explained by the particular context and dynamics within adoptive families. Adoptive parents typically undergo extensive informational preparation and rigorous procedures involving prolonged use of online platforms and digital resources (Palacios & Brodzinsky, 2010). This sustained exposure to digital tools during the adoption process likely enhances their digital competencies and fosters greater confidence in their abilities to navigate online environments, explaining their higher digital literacy scores. Furthermore, the heightened parental involvement reported by adoptive parents might reflect increased sensitivity and vigilance arising from awareness of their adopted children's potential vulnerabilities. Previous literature consistently shows that adoptive parents display intensified protective attitudes, driven by their heightened awareness of their children's unique developmental histories and needs (Fursland, 2021; Palacios & Brodzinsky, 2010).

In line with this interpretation, our qualitative findings reinforce the idea that adoptive parents manifest heightened concern regarding relational and child-specific harms associated with AI (e.g., unwanted contacts, emotional triggers due to identity-related content). From the standpoint of community psychology, this heightened vigilance can be seen as an adaptive parental response aiming to create a secure "digital base" (Lancini, 2019; Turuani & Lancini, 2020). A secure digital environment, much like the secure attachment base theorized by Bowlby (1972), might empower adopted adolescents to safely navigate and explore the digital sphere, supporting their developmental and emotional needs while mitigating potential harms specific to adoption contexts.

An intriguing aspect of our findings concerns parents' perceptions of their children's Trait Emotional Intelligence (EI). Specifically, biological parents rated their children's emotional competencies significantly higher compared to adoptive parents. Several explanations might account for this finding. First, adopted children frequently come from challenging backgrounds characterized by early adverse experiences or institutionalization, potentially impacting their emotional development and competencies (Batki, 2017; Paine, 2021) and, in light of these considerations, it is plausible that adoptive parents' lower Trait EI ratings reflect actual difficulties experienced by their children. Alternatively, methodological considerations must also be acknowledged: as our measure of Trait EI relied exclusively on parental ratings, it is conceivable that biological parents overestimated their children's competencies due to cognitive biases and positive parental expectations (Gugliandolo *et al.*, 2019; Kawamoto *et al.*, 2021). Conversely, adoptive parents, possibly more

attuned to their children's emotional complexities through heightened involvement, might offer more realistic appraisals of their children's emotional functioning. Further research employing both self-report and objective measures of Trait EI could clarify this critical issue.

Lastly, the analysis of perceived AI risks and opportunities yields important insights into parental concerns and priorities. Both adoptive and biological parents identified similar core concerns: privacy, misinformation, cognitive disengagement, and dependency. Nonetheless, adoptive parents more frequently highlighted relational and emotional risks uniquely relevant to adoption experiences, such as unintended emotional triggers related to identity and family history. This differential focus is consistent with broader evidence that adoptive families experience distinct relational dynamics and are thus more attuned to potential emotional risks (Brodzinsky, Gunnar & Palacios, 2022). The fact that a substantial proportion of parents across both groups provided no clear response or stated "I do not know" further underscores the significant knowledge gap that exists around AI. From a community psychology perspective, this finding indicates the urgent need for targeted educational interventions designed to build digital competence and awareness, enhancing parents' capacities to guide their children's digital engagement effectively.

4.1 Limitation and future directions

This study has several limitations. First, our sample of 180 parents from southern Italy may not fully represent the wider population. Extending the research to include parents from other regions or countries would strengthen the conclusions. Second, a further concern regards the demographic information available for our sample. Aside from age and sex, we did not collect more granular indicators such as parents' years of formal education, household income, or detailed occupational classifications. Although preliminary analyses showed no group differences in the broad categories of education and employment we did record, the absence of finer-grained data restricts our ability to examine how socioeconomic factors might intersect with digital literacy and parental involvement. Future studies should gather a fuller demographic profile, particularly educational attainment and socioeconomic status, to clarify whether these variables moderate parents' attitudes toward AI and their capacity to support adolescents' digital engagement. Third, we relied exclusively on parent-reported measures, particularly regarding their children's emotional intelligence, which individual perceptions may influence. Future studies should consider incorporating direct assessments or self-reports from adolescents to improve objectivity. Fourth, many open-ended

responses were left blank, particularly regarding AI benefits and risks; in the future, combining interviews or focus groups could encourage richer and more complete feedback. Finally, our data are cross-sectional, and exploratory, capturing only a single point in time. To understand changes in parents' digital attitudes and behaviors, especially as AI technologies evolve, it will be important to implement longitudinal studies.

5. Conclusions and practical implications

Our findings suggest a real opportunity to strengthen parents' digital knowledge and role in guiding their children's interactions with AI. Even though biological and adoptive parents showed similar levels of AI usage and trust, adoptive families reported higher digital literacy and more active involvement. This suggests that educational support programs specifically designed for parents can help everyone engage more confidently with AI. Workshops or online courses could cover basic digital skills, data privacy, and emotional regulation when interacting with AI tools. In adoptive families, particular attention should be given to building a "safe digital base" – a supportive environment where adolescents feel secure exploring technology without exposing themselves to emotional harm or privacy risks. Involving schools and community centers in co-led group sessions can help parents learn together and share best practices, creating stronger family–technology alliances across the broader community.

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Wearable AI technologies in reading and writing community: a participatory observation co-conducted with Plaud

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Abstract

With the integration of Wearable AI Technologies into community interventions a reflection has started on the potential of these tools to innovate and simplify qualitative participatory research practices. This paper presents an investigation of the use of artificial intelligence PLAUD within the context of the Internet of Things (IoT) as a device for capturing interactions within graphomaniac communities. Specifically, the study involved 42 participants during meetings of Parole Notturme, a Palermo-based collective dedicated to promoting Community Reading and Writing. The primary objective is to critically evaluate the added value of wearable AI technologies, considering the prospect of kurzweilian technological singularity.

Keywords: PLAUD, Wearable AI Technologies, Reading and Writing Community, graphomaniac community, participatory observation, Community Education.

Riassunto. *Tecnologie AI indossabili nelle comunità di scrittura e lettura: una trascrizione di un'osservazione partecipata co-condotta con Plaud*

Con l'integrazione delle Wearable AI Technologies negli interventi di comunità si è avviata una riflessione sulla capacità di tali strumenti di innovare e semplificare le pratiche di ricerca qualitativa partecipata. Questo articolo presenta un'indagine sull'impiego dell'intelligenza artificiale PLAUD, inserita nel contesto dell'Internet delle Cose (IoT) quale dispositivo per la raccolta delle interazioni nelle comunità grafomani. In particolare, è stato esplorato con

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42 partecipanti l'utilizzo di PLAUD durante gli incontri di Parole Notturne, un collettivo palermitano impegnato nella diffusione della Lettura e Scrittura di Comunità. La finalità è di valutare criticamente il valore aggiunto derivante dall'impiego delle IA indossabili, in previsione della singolarità kurzweiliana.

Parole chiave: PLAUD, tecnologie AI indossabili, Lettura e Scrittura di Comunità, comunità grafomani, osservazione partecipante, Educazione di Comunità.

1. Introduction

The Internet of Things (IoT) has long since begun to reshape the existing landscape in which people and technologies interact (Greengard, 2022). The new scenario presented by the Fourth Industrial Revolution (Castiglione, 2024a) is no longer a distant, dystopian, or science-fictional image; it has concretely arrived in our streets, offices, homes, and screens, bringing with it numerous unanswered questions regarding professional and personal prospects (Gondosubroto, 2024). Whether in artistic, technical, or scientific fields, Kurzweil's scientific prediction is rapidly becoming a reality (Raman *et al.*, 2025).

While we search, with a mixture of fear and fascination, for ways to counter what computer scientist Ray Kurzweil anticipated, every theory supporting technological acceleration is unfolding into tools and practices that are beginning to confirm many predictions about the future of artificial intelligence (Kurzweil, 2024). From a educational community-based perspective, two categories of people can be identified: those who favor (techno-optimists) and those who oppose (techno-skeptics) the potentially unstoppable phenomenon of mobile technological devices (e.g., PCs, smartphones, AI Pins, AI Notes), born with new functionalities enhanced by artificial intelligence (Kołodziejska & Paliński, 2025). However, few preventive educational interventions currently explore how to conscientiously integrate these digital and material tools into psychopedagogical contexts, whether involving young people or adults. Beyond any simplistic stance, the arrival of artificial intelligence in everyday accessories – now often wearable – is undoubtedly transforming how we work, communicate, educate, and, very likely, how we exist. This pervasive transformation, driven by the evolution of an increasingly technologically advanced society, relates as much to individual readiness to embrace change as it does to society's ability to make opportunities democratic, conscious, and accessible (Paliński, 2024). It's important to emphasize that one of the main potential risks inherent in new technologies is the missed opportunity to introduce them thoughtfully, so as not to exacerbate the digital divide between privileged and vulnerable social groups (Poggi, 2024).

One of the aspects this study aims to explore is how a psychopedagogical research design can instrumentalize one of the most recent innovations in artificial intelligence: the PLAUD device, which belongs to the field of Wearable AI Technologies¹. The objective is to foster greater awareness through the detailed account of participant observation (Roque *et al.*, 2023), its netnographic findings and adapted contextualization (Kozinets *et al.*, 2024). This approach opens a potential perspective for concrete, supportive assistance rather than human substitution. In the following sections, we will explore how wearable artificial intelligence can significantly enhance data collection in support of spontaneous, grassroots, zero-cost experiences such as those initiated by the Parole Notturme collective. Consequently, we will examine the tangible benefits artificial intelligence can offer in preventing community-based Reading and Writing from becoming merely a temporary phenomenon, instead transforming it into a collected narrative memory that is both transferable and shareable.

One of the latest AI Pins was utilized for this study, specifically programmed to accurately transcribe the words, emotions, and interpretations of the chosen graphomaniac collective, representing an intergenerational research target consisting of 42 participants with an average age of 27 years (20 females and 22 males). This work represents a pioneering starting point for future research aimed at integrating devices like PLAUD into Communities of Practice, moving beyond their simplistic use as mere recording devices for lectures, consultations, and conferences. The PLAUD device, previewed at Europe's most important technology fair in Berlin in 2024 and officially available on the market from 2025, is among the latest innovations in the field of AI Pins and is enjoying considerable success (Huang, 2024). Compared to other Wearable AI Technologies, the criteria guiding its selection as the preferred tool for this research included availability, cost, ergonomics, practicality, ease of use, battery life, ChatGPT enhancement, Italian language translation, recording duration capacity, and noise reduction capabilities in highly open environments. The intention behind using an AI Pin

¹ The Plaude NotePin (2025) is an intelligent wearable device designed for recording, transcription, and advanced analysis of audio content, leveraging cutting-edge artificial intelligence technologies. It combines lightweight, miniaturized hardware with sophisticated software algorithms to facilitate the collection and management of qualitative and conversational data. From a technical standpoint, the device weighs approximately 16 grams and has compact dimensions that enable convenient use in multiple ways: it can be worn on the wrist as a bracelet, clipped onto clothing as a pin, or worn around the neck as a necklace. It comes equipped with an internal memory of 64 GB, sufficient for recording approximately 20 hours of continuous audio. The NotePin supports audio recording in over 112 languages and features a highly sensitive microphone designed to capture high-fidelity audio even in noisy environments.

within a strongly defined context and a culturally and creatively driven group was also a way to demonstrate how the purpose of any artificial intelligence intervention changes based on its design. In this specific instance, PLAUD did not compromise the creativity of authors and readers; instead, it was intentionally integrated as a supportive tool for Parole Notturme, primarily to ensure that all shared stories would not be lost at the end of each gathering.

2. Plaud AI online in the offline cultural activities of Parole Notturme

The current lack of adoption of Wearable AI Technologies in educational, cultural, and community contexts highlights a delay in demonstrating to these environments the potential of the tools available to them, capable of simplifying both intervention practices and participatory qualitative research. Such technologies offer unprecedented opportunities to observe, record, and study interactions in real-time within dynamic, face-to-face social situations, potentially optimizing traditional practices of intervention, data collection, interpretation, and reporting (Zhang & Zhou, 2024).

Within this framework, the present study explored the use of PLAUD in specific Community Reading and Writing sessions organized by Parole Notturme, a spontaneous collective based in Palermo. The research, which utilizes artificial intelligence as both a tool and method – not replacing but complementing human engagement – could provide additional meaning to what is currently resurfacing as an almost primitive social need: meeting face-to-face, sharing stories, and actively listening, in direct contrast to commodified digital storytelling (Han, 2024). Using an internet-connected device programmed with ChatGPT might appear to undermine offline contexts, which today are increasingly valued within current cultural trends (Johnson & Smith, 2025). Instead, the adoption of a bracelet integrating both physical and digital AI becomes instrumental in preserving these practices through accurate transcription, provided an appropriate prompt is given. In the past, substantial resources and time were required for experiences to be documented; consider the figure of a researcher, educator, or facilitator promptly taking notes on the context, participant dynamics, and impersonal reflections related to professional or semi-professional experiences. Now, the ability to observe, record, and systematically collect words, emotions, and qualitative results is significantly accelerated by cutting-edge devices. This paves the way for a new understanding of artificial intelligence as an aid for facilitators or observers within offline settings.

Parole Notturme gathers once a week, particularly on Wednesday evenings, engaging people of various ages who wish to express themselves through

community-based Writing and Reading, bringing poetry into public spaces as a shared, democratic, accessible, and thus communal cultural experience. The phases of this graphomaniac practice include (Parole Notturmo, 2023): choosing an inspiring theme prior to the meeting; pre-selecting texts already personally written (in prose or poetry) or excerpts from published books; welcoming participants and explaining the circular methodology; starting the open-mic reading session; a mid-session break; continuation of readings; and concluding with a collective writing activity signed by each participant. The facilitator of this Palermo-based experience is a young nomad named Vladimir Luna Moreno, who founded the spontaneous group between 2022 and 2023, aiming to bring poetry back to the streets of Palermo – and beyond. The primary aim of Parole Notturmo is not to digitize the narrative forms they analogically promote; however, this has not prevented them from integrating artificial intelligence into their practices for research and improvement purposes, reinforcing the offline elements they wish to preserve. This approach could inspire others to embrace innovation capable of supporting projects conceived as offline, without foregoing substantial assistance made feasible through wearable, non-invasive artificial intelligence.

If it is true that the IoT is rapidly becoming an existential condition of involution, it is essential to consciously choose which Internet-connected things can genuinely support us, ensuring we do not become tools of AI, but rather humans aware of what we might become alongside machines, aiming toward an ethically and humanly conscious singularity (Castiglione, 2023). Integrating smart devices into communities of practice, such as graphomaniac groups, enables a precise and immediate memory of lived experiences. Wearable technologies enhanced by artificial intelligence represent a decisive turning point, allowing continuous, non-intrusive data collection and facilitating the replicability of successful practices.

3. Research methodology and results using an AI Note

This section will concretely describe the participant observation experience co-conducted with PLAUD. Reference is made to Ray Kurzweil's theory of singularity, according to which humanity is currently undergoing a transitional phase toward a new era known as "Technological Singularity", in which artificial intelligence and human intelligence will assume an Anthropocenic extension. (Bostrom & Tegmark, 2024). The intention is to emphasize a Pedagogy of Singularity as a response to the challenge of preparing education and culture for this new era, without prejudiced rejection. Incorporating the skills needed to address future challenges is one of the implicit

invitations of the qualitative methodology facilitated by PLAUD, reducing the separation between the subject under study and the tools employed to conduct sociocultural and community-based educational research. Using Wearable AI Technologies as support tools for the collection and systematization of qualitative data is useful for elevating artificial intelligence into an ally of human – and specifically educational – processes. Establishing a Pedagogy of Singularity must include the use of technological tools not commonly considered by spontaneous, grassroots groups like Parole Notturne. In doing so, it is possible to contribute to reducing delays in introducing tools, destined to become increasingly present in people's lives, into contexts that currently seem distant (Castiglione, 2023). For all this to have intentional awareness, it is important to adapt the tools to the interests of the target audience. Based on the above premises, this study aimed, on different levels, to answer the following research question: with PLAUD, is it possible to collect data and transcripts useful for investigating, preserving, and further systematizing practices conceived as offline and traditional, such as Community Reading and Writing?

To answer this question, a participant observation was initiated, a research methodology that allows the researcher to personally experience the groups they join without disrupting the context (Semi & Bolzoni, 2022; Chiriatti, 2021). The use of PLAUD made it possible to respect what the writing community of Parole Notturne, and thus its participants, wished to protect in terms of group atmosphere, offline approach, and respect for written and read content. Community writing and reading refers to the act of writing and reading within a community setting, whether physical or virtual. Narrative (of the self, the context, and the other) becomes a tool for creating social bonds, fostering communication, and addressing the issues experienced by the community to which the writer belongs. This methodology unfolds in three specific phases: free writing based on one or more prompts; a moment of reading the pieces created in the here and now of the meeting; and finally, within this, deep listening, where one meets the other, refraining from evaluations and judgments. Community writing encourages civic engagement, collective voice, and can serve as a tool for social change (Castiglione, 2023). To situate this methodological choice within the framework of community psychology and pedagogy, it is important to note that writing and reading in a collective setting resonate with the principles of sense of community, empowerment, and social cohesion, which are widely discussed within the disciplines that inform this work. Community psychology, when combined with Community Writing, emphasizes the role of shared narratives and collective practices as driving forces for social participation and well-being among adolescents and beyond (Castiglione, 2023; Cicognani *et al.*, 2012; Mannarini, 2004). From

this perspective, the act of co-constructing and sharing texts can be understood as a process of symbolic empowerment, in which individual experiences are transformed into collective meanings capable of strengthening the bonds among members (Procentese & Gatti, 2019). Moreover, as Lavanco and Novara (2012) point out, community contexts that foster dialogue, reflexivity, and mutual recognition are crucial not only for promoting personal growth but also for encouraging civic engagement and social transformation. Thus, community writing and reading practices can be interpreted as interventions that connect personal narratives with collective identity, offering participants both a protected space for expression and an opportunity for active participation in the life of their community (Gatti & Procentese, 2022).

The experience presented here was conducted from April to June 2025 and involved 42 people, 20 females and 22 males, within the hosting community of Parole Notturme. The research was structured into three phases. The first involved identifying the context, defining the reference sample, and establishing the moments designated for recording through PLAUD². The implementation phase consisted of using the wearable, Internet-connected device to employ AI during Community Reading and Writing meetings. The final phase was dedicated to processing the recorded data and the responses generated by this prompt (as noted, it is advisable to formulate the prompt in a personal and first-person form):

- *context*: I'm interested in transcribing training sessions as well as meetings in which people's words, thoughts, and emotions are significant. The research has a psychopedagogical focus;
- *objective*: the main objective is to use these recorded sessions for qualitative research through the support of transcriptions. In terms of style, I need to test a transcription that faithfully reflects both the tone of participants and the key points of the research;
- *answer*: The model's response should consider the collection of qualitative data regarding words, key themes, gathering relevant information, and accuracy in categorization. Additionally, it should always attempt to provide an interpretation of the data collected from the recordings, serving as a virtual research assistant aiding me in the investigation through these recordings;
- *format*: the response format must provide clarity and completeness, allowing me to accurately report everything later in the research. I prefer not to have too many bullet points; use them only when truly necessary, and avoid emojis. Subsequently, the netnographic data was collected

² The resulting transcription is then analyzed through large language models (LLMs), enabling automatic text transcription; speaker recognition (speaker labeling); automated summarization; mind-map generation.

through the PLAUD Web application³, presented below divided according to the three meetings conducted.

4. Netnographic responses from Plaud

In this section, the outputs generated by the PLAUD app will be reported verbatim and in full, to illustrate the potential of this tool for those who may wish to replicate the process carried out by the researcher.

4.1 First participatory observation with Plaud

Interpretative summary of the session: the session represents a living laboratory of expression and sharing, a social and psychopedagogical microcosm where written and spoken words become the primary vehicle for constructing meaning, both individually and collectively. Participants do not merely read texts; rather, they stage their own narratives, exploring and negotiating their identities through creativity. From a psychopedagogical perspective, the event exemplifies informal peer-to-peer learning. Participants learn from one another through empathetic listening and exposure to diverse styles, themes, and life experiences. The Exquisite Corpse game represents the culmination of this process: an act of co-creation that dissolves individual authorship into a single collective voice.

Qualitative data analysis and key themes: the analysis of texts and interactions has enabled the identification of four central macro-themes.

1. *Exploration of self and existential condition.* This emerged as the most recurring theme. Many texts take the form of introspective journeys, exploring complex emotional states such as alienation, loss of identity, and anger. These contributions illustrate how the reading space becomes a legitimized environment to express psychological distress and suffering, transforming individual pain into a shared – and therefore more sustainable – experience.
2. *Creativity as a refuge and tool for connection.* The creative act is presented not only as an end in itself but as a vital function. Writing and reading serve as tools to make sense of chaos, escape a difficult reality, or

³ As stated on the official websites, cloud storage is managed through certified platforms (AWS, Azure, Google Cloud), adhering to high standards of personal data protection and confidentiality. For further details, please refer to the official website: <https://it.plaud.ai/products/plaud-notepin-wearable-ai-voice-recorder>.

build connections. Creativity emerges as a transversal competence, a resource participants draw upon to process their experiences and establish relationships with others, thus overcoming isolation.

3. *Memory, loss and social commitment.* Several contributions link personal experience to historical, collective, or political dimensions, demonstrating an awareness that goes beyond the individual. The group is not solely inward-looking. Instead, language also becomes a tool for bearing witness and asserting ethical and political stances within the world.
4. *Group dynamics and metanarrative.* Informal conversations before, during breaks, and after readings constitute important data. They reveal how the community is built, sustained, and reflective upon itself. Leadership appears distributed, and the group self-regulates through a set of shared practices and rituals.

Final interpretation and points for further investigation: this session of Parole Notturme provides a fertile ground for qualitative research. Words, thoughts, and emotions are not merely contents but ongoing processes.

Points of connection: a common thread connecting almost all contributions is the theme of loss and seeking. Participants express losing a home, love, their identity, the sweetness of flavors, or even a canary. Corresponding to each loss is a search for meaning, healing, connection, a new home, or oneself.

Points of divergence: the most interesting divergence lies in the movement between internal and external perspectives. There's a continuous oscillation between deeply introspective, almost solipsistic texts (hatred for one's neighborhood, existential exhaustion) and texts that open outward toward the world, others, and politics (indigenous women, Paris, Gaza). This tension is what makes the session dynamic and complex. For your research, it would be interesting to analyze how participants navigate this tension. How can the expression of intimate, personal pain become the starting point for collective and social reflection? Conversely, how are the broader narratives of the world filtered and reinterpreted through the lens of individual experience? This group seems to provide an ideal laboratory for observing these processes in action.

4.2 Second participatory observation with PLAUD

The recorded meeting presents itself as a composite event, intertwining moments of public reading, informal social interaction, and creative sharing within a group.

Context and structure of the meeting: the meeting is structured into several phases, below described.

1. *Initial reading of a text:* the session opens with the reading of an excerpt attributed to Gunther Anders (from *The Obsolescence of Man*), describing a dystopian society built on control and conditioning of individuals. This text serves as a powerful intellectual and critical stimulus, establishing a reflective and potentially provocative tone;
2. *break and social interaction:* a break follows, during which participants interact freely. This phase is crucial for observing interpersonal dynamics and community-building processes;
3. *shared reading session (Reading Circle):* the heart of the meeting is the participants' reading of texts, either their own or others'. A suggested theme (madness) is mentioned, serving as a potential connecting thread, though expressive freedom remains broad;
4. *Creative writing game (Sanko Kass):* alongside the readings, a sheet circulates for a collaborative writing game, aimed at creating a story starting from the prompt "sugar and coffee";
5. *conclusions and announcements:* the session concludes with the reading of the text created during the Sanko Kass activity and announcements regarding future events, reinforcing a sense of continuity and community.

Key themes and relevant words: from the analysis of spoken interactions and read texts, several key themes emerge. See below.

- *Social criticism and control:* introduced by Anders' text, this theme resonates in various readings addressing conformity, manipulation, and social indifference;
- *creative expression and catharsis:* reading and writing are presented as powerful tools for self-expression, processing complex emotions, and finding one's voice;
- *community and belonging:* the meeting manifests a need for community, highlighting the value of shared spaces, mutual listening, and support;
- *vulnerability and authenticity:* many participants expose themselves through intimate texts, revealing their vulnerability. This openness ap-

- pears to be encouraged and valued within the group, fostering an environment of authenticity;
- *memory and identity*: narration contributes to the construction and preservation of memory and identity.

1. *Dynamics and implicit psychopedagogical practices*: the environment safe space appears to encourage free expression and acceptance, essential elements for transformative learning and the sharing of emotionally charged experiences.

Collaborative and horizontal learning: Sanko Kass is an example of collective creation. The readings, although individual, contribute to a shared experience of meanings. There is no dominant teaching figure; rather, facilitation emerges clearly (e.g., the person moderating the readings).

Valuing the word: the emphasis on reading and writing as vehicles of thought, emotion, and critique is central. Careful listening is encouraged.

2. *Emotional and psychological content*: the texts read range from philosophical reflections on existence to explorations of pain and mental illness, from anger-tinged social criticism to irony and playfulness.

3. *Psychological elements*: the group represents a urban micro-community that self-organizes to create alternative spaces of meaning and sociality, “in undergrowth we need to nurture and help flourish”.

Cultural resistance: the act of gathering to read, write, and discuss profound themes can be seen as a form of resistance against the superficiality and cultural homogenization described in Anders’ initial text.

Marginality and voice: some texts give voice to experiences of marginality (homelessness, mental illness, loneliness), challenging dominant narratives.

Interpretation of collected data and research insights: from a psychopedagogical standpoint, the meeting functions as a laboratory for emotional and critical literacy. Through reading and listening, participants not only refine their linguistic and expressive skills but also explore and share complex human experiences. The horizontal structure and welcoming atmosphere promote non-judgmental learning, grounded in experience and shared reflection. Further research could investigate how these spaces contribute to developing empathy, critical thinking, and self-awareness as well as awareness of others.

From an educational perspective, these meetings represent forms of social and cultural capital created from below. They are spaces where bonds are

built, values shared, and collective narratives developed that can either contrast with or complement mainstream narratives.

Connection and divergence:

- connection, the initial text by Anders, although an external reading, deeply connects with many of the themes that spontaneously emerge from participants' readings. It serves as an interpretive framework;
- divergence, despite the suggested theme of madness, the variety of texts demonstrates expressive freedom, allowing exploration of diverse emotional tones: from humor to tragedy, from social criticism to lyrical intimacy. This heterogeneity represents a valuable richness.

In conclusion, the recorded session offers dense and layered material. The proposed approach can assist you in extracting accurate and relevant information for your research, serving as a "virtual research assistant" in exploring the internal connections and divergences within the collected material.

4.3 Third participatory observation with Plaud

Synthesis and Analysis: the transcribed session documents a collective reading and writing gathering held in an informal and community-oriented setting. Participants take turns reading their own texts, literary excerpts, poems, songs, aphorisms, and stories, interspersed with moments of improvisation, dialogue, and shared reflection. The atmosphere is participatory, welcoming, and occasionally playful, reflecting a strong sense of belonging and openness toward individual expression.

Key themes emerged:

- The encounter and relationship, both literal and symbolic, permeate many readings and testimonies. Friendship, love, family ties, casual yet meaningful encounters, and searching for oneself through others are prominent topics;
- writing and shared reading emerge as tools for self-narration, emotional exploration, and collective meaning-making. The collaborative writing activity symbolizes co-creation and the negotiation of meanings;
- irony and levity, humor, parody, and levity recur as strategies for engaging with deep or painful themes;
- many texts express fragility, desire, absence and vulnerability, longing for love, the need for recognition, fear of loneliness and madness, but also the capacity to embrace vulnerability as part of the human experience;

- the reflection about value and happiness include the notion of value (personal, social, artistic), competitiveness, the pursuit of happiness, and the meaning of life.

Group dynamics: the group is structured as a reading circle, emphasizing free participation and mutual listening. Interaction is horizontal and non-judgmental, with alternating moments of seriousness and playfulness. References to future events and a mailing list suggest continuity and forward-thinking planning within the group.

Divergences and connections: the first term refers to differences in style, tone, life experiences, and worldviews emerge and are embraced as sources of richness and stimuli for dialogue. The connection of participants identifies a shared language, emotional experiences, and the practice of writing as a space for freedom.

Interpretation: the documented meeting represents a significant example of psychopedagogical practice based on storytelling, listening, and the co-construction of meaning. Shared writing and reading become tools for empowerment, mutual recognition, and the processing of personal and collective experiences. The group serves as a safe space for exploring identity, engaging with diversity, experimenting with creativity, and addressing vulnerabilities without fear of judgment.

From a qualitative research perspective, this session provides rich material for analyzing processes of self-construction, group dynamics, narrative strategies, and emotional management practices.

Operational conclusions: the transcription can be used to identify narrative patterns, coping strategies, modes of identity construction, and group dynamics; it is suggested to deepen the analysis of collective writing practices and language games as tools for inclusion and meaning negotiation; the documented experience can serve as a replicable model for promoting educational communities and active citizenship practices through storytelling.

5. Conclusions, insights, and limitations

The data gathered during the Parole Notturme meetings clearly illustrate how the PLAUD device, through wearable artificial intelligence technolo-

gies, represents a valuable methodological resource for participatory qualitative research.

The observed context, characterized by an informal, welcoming environment strongly oriented toward the free expression of emotions and thoughts, facilitated the emergence of deep existential themes (such as loss, identity search, loneliness) as well as collective and social issues (critiques of contemporary society, political and social engagement). The wearable technology effectively captured the semantic, emotional, and relational richness present in verbal and non-verbal interactions, demonstrating considerable capability in preserving the original tone and meaning of participants' contributions.

From a psychopedagogical perspective, the educational value of these meetings emerges clearly, shaping an informal and shared learning environment. The absence of hierarchies and the appreciation of diversity foster horizontal and reflective learning dynamics, where each participant actively contributes to collective knowledge through authentic expression and empathetic dialogue. PLAUD made it possible to capture and emphasize the educational significance of group dynamics and collaborative writing practices.

These meetings represent a significant form of grassroots social and cultural capital. The collective not only provides a safe space for emotional sharing but also acts as a site of cultural and political resistance. Within this context, technology is not invasive but complementary, allowing accurate documentation and analysis of relational and narrative processes that form the group's identity.

Automated data collection through PLAUD, supported by a carefully crafted specific prompt, demonstrated high precision in categorizing emerging themes and relevant information. Collected data clearly highlight points of connection and divergence, confirming the methodological validity between automated transcriptions and participant observation (Kozinets, 2020; Kozinets & Gamberti, 2020).

The interpretation underscores how the use of wearable AI technologies, particularly PLAUD, significantly enhances qualitative psychopedagogical research. Such technologies enable richer data collection and open new methodological, ethical, and theoretical perspectives regarding the relationship between technology and communities (Duggley *et al.* 2020). Nonetheless, it remains necessary to further develop the balance between human and technological competencies to maximize benefits and minimize potential drawbacks. Future studies could further explore the ethical, artistic, and social implications of these technologies, investigating new modes of collaboration between artificial intelligence and communities of practice.

However, the integration of technologies such as PLAUD also raises relevant methodological concerns that deserve critical discussion. While the device enabled effective data capture and categorization, further reflection is needed on the reliability of fully automated interpretation processes (Christou, 2023).

Can the automatic interpretation of results through PLAUD fully replace critical human observation, or must it be complemented by dialogical processes to faithfully represent the complexity of community-based experiences?

This question highlights a fundamental issue: the risk of bypassing core principles of community psychology and pedagogy, such as subjectivity, contextuality, and affective dynamics, when relying solely on machine-generated data. A future research direction may involve integrating interjudge evaluation or triangulated human oversight to enrich and validate the analysis process. Far from rejecting innovation, this approach promotes a more balanced and ethically grounded use of wearable AI technologies, especially within sensitive, community-driven research contexts (Kozinets & Seraj-Aksit, 2024).

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University and digital transition: the community map as a psycho-educational tool for the care and enhancement of the shared spaces of a university campus

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Abstract

The article examines the development of a community map for the campus of the University of Palermo, carried out by students as part of an educational experiment. Within the framework of community psychology, innovative digital tools (GIS and online mapping) were employed to foster the care of shared spaces. Students developed skills in analysis, collaboration, and active participation. The use of open-access online digital software (Google My Maps and QGIS) made the process engaging, supporting the acquisition of digital competencies and active citizenship. This initiative highlights the potential of digital technologies in practices of caring for shared living spaces, as well as their possible impact on the sense of belonging and civic responsibility within the academic community.

Keywords: Community mapping, academic community, digital technologies, active citizenship, civic responsibility, university campus.

Riassunto. *Università e Transizione digitale: La mappa di comunità come strumento psicoeducativo per la cura e la valorizzazione degli spazi condivisi di un campus universitario*

L'articolo analizza la costruzione della mappa di comunità per il campus dell'Università degli Studi di Palermo, svolta durante una sperimentazione didattica dagli studenti. Nel quadro della psicologia di comunità, strumenti digitali innovativi (GIS e mapping online) sono stati impiegati per promuovere la cura degli spazi comuni. Gli studenti hanno sviluppato capacità di analisi, collaborazione e partecipazione attiva. L'uso dei software digitali online open

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access (Google My Maps e QGIS) ha reso il processo coinvolgente, favorendo l'acquisizione di competenze digitali e di cittadinanza attiva. Tale iniziativa mostra le potenzialità delle tecnologie digitali nelle pratiche di cura degli spazi di vita condivisi, e le possibili ricadute su senso di appartenenza e responsabilità civica della comunità accademica.

Parole chiave: Community mapping, comunità accademica, tecnologie digitali, cittadinanza attiva, responsabilità civica, campus universitario.

1. Introduction

In a context where the challenges related to the management and care of shared spaces play an increasingly central role in the dynamics of university life, the University of Palermo promoted an innovative educational experiment aimed at actively involving students in the protection and enhancement of their living and study environment. The educational activity, usually carried out in classrooms, brought students from educational and psychological courses into the natural environment of the campus its open spaces, gardens, and wooded park putting into practice the photovoice methodology (Santiniello & Vieno, 2013). This latter is a strategy of psychoeducation and empowerment (Rappaport, 1987; Zimmermann, 2000) which, through the participatory analysis of self-produced images, gives voice to lesser-known aspects of daily life to develop proposals for intervention to be shared with stakeholders. This methodology involves, after a phase of photographic exploration and group analysis of the main emerging themes, the organization of a collective event to raise community awareness of the needs expressed by participants and to modify the social representation of reality itself.

Since the 2023-2024 academic year, students have been experimenting with the phases of photovoice, from taking photographs to organizing a collective participatory action. On the occasion of the first Community Fair, organized by students in collaboration with the TLC-CIMDU, the themes of sustainability, care of spaces, and inclusion were addressed through open-air workshops held in the green and informal areas of the campus. Faculty and students from psychology and pedagogy, architecture, engineering, and law took part in the initiative, with the conviction that integrating knowledge and insights from different perspectives can lead to more sustainable improvements, mutually beneficial outcomes, and scientifically rigorous actions. The university "citadel" like local communities, has geographical boundaries and environmental resources that serve as settings for active learning, shaping the everyday experiences of all university actors, including the livability of spaces and related services.

Carrying open-air workshops with students and faculty from different disciplinary areas means rediscovering the campus as a place not only of study and training but also of gathering, social interaction, and the blending of people and knowledge. As stated in Line 5 of the Strategic Plan of the University of Palermo, this responds to a specific strategy of promoting students' sense of belonging, considered a priority in higher education environments, given its multiple benefits for academic life (Galioto *et al.*, 2025).

In this context, the experience presented here of the MyCamPus Lab is situated, one of the workshops of the Community Fair, carried out at the proposal of students who, through photovoice, had expressed the need to create a mapping of the campus using methods of active participation. This specific need was addressed by some faculty members of architecture who specialize in urban context mapping and who, for several years, have been conducting similar experiments on the campus.

Using advanced digital tools, particularly Geographic Information Systems (GIS), students took part in the creation of a community map aimed at capturing different perspectives and needs for improving the campus from the entire student body. The adopted methodology, which combined aspects of civic participation, digital skills, and critical analysis of spaces, involved the use of online software such as Google My Maps and QGIS, tools that made the process more dynamic, accessible, and engaging, while fostering the acquisition of transversal skills within a community participation approach (Ceri, 1991; Mannarini, 2004). From this perspective, participation is configured not only as spontaneous but also as “provoked” under the guidance of expert faculty members, who lead participants to experience a social function of collective interest (Meister, 1969). Involving students in the development of a shared map primarily meant making them feel like actors in the desired social change. Indeed, the experiment enabled them to highlight issues such as neglected areas, underutilized or degraded spaces, as well as opportunities for the redevelopment and enhancement of the environment.

The initial idea stems from a reflection on the opportunity to consider the university as a “common good” (Wittel, 2018), an identity-shaping place (Pedler *et al.*, 2021; Signore *et al.*, 2024) where an academic community lives, recognizes itself, and intends to take care of.

On the other hand, with regard to the theme of community, university campuses often reproduce the main functions of a city on a smaller scale and, as in cities, these spaces require an integrated system of decision-making between governance and citizens (Torrisi & Pernagallo, 2022) in order to improve well-being and service delivery, reduce forms of decay and/or misuse, and enhance functions that are significant and potentially beneficial to the entire community.

Within this scenario, in particular, the open public spaces of the university play a significant role not only in students' education but also as areas of socialization, directly contributing to the quality of life of the entire academic community. Life on campus, in fact, is study and work, but also a network of relationships and informal social interactions. In addition to fostering favorable conditions for more effective learning (Wentzel & Wigfield, 1998), the quality of campus spaces substantially contributes to students' personal and relational growth, developing place identity (Proshansky, 1983).

This experience enabled students to develop territorial analysis, collaboration, and active participation skills. The creation of the community map made it possible not only to give voice to students' perspectives on what should be changed in the campus to improve their academic quality of life, but also to engage them as builders of meaning and solutions, as they themselves are actors of change with a renewed sense of belonging. The initial results demonstrate the potential of digital technologies as tools for collective empowerment and the promotion of shared care practices (Peterson & Reid, 2003; Peterson & Zimmerman, 2004), offering valuable insights for future initiatives in civic participation and the sustainable management of university environments.

The article aims to present the initial outcomes of the experiment carried out on the campus of the University of Palermo, focusing in particular on the organizational framework of the community map experience, given the degree of innovation it represents with respect to usual educational structures, and offering a reflection on the opportunities created by this activity.

2. Community mapping: notes for an interdisciplinary focus

In international literature, community maps are conceived as a product-process of participatory practices of identity self-representation and recognition of the values of places, involving the resident communities or, more broadly, those who perceive themselves as an integral part of those places (Altmann, 1975; Brower, 1980; Sack, 1983). The identity component of the community and that of place perception (Proshansky, 1983) constitute the essential elements of this type of cartographic representation, generally in paper form but increasingly digital, which, compared to traditional technical representations, favors informal representation codes and iconographies that allow everyone to immediately grasp the characteristics/values of places (Gatti & Procentese, 2021). From a diachronic perspective, community maps represent the most recent evolution of the so-called "cognitive maps", developed by a local community starting from Kevin Lynch's work in the 1960s.

The fields of application highlight the great versatility and use of this tool even beyond urban planning. References range from those providing an overview of this practice and its applications (Lydon, 2003; Chambers, 2005; Perkins, 2007; Wood, 2010), to those analyzing its transposition into the GIS field (Dunn, 2007; McCall *et al.*, 2015), including more qualitative approaches (Panek & Pashto, 2017; Wridt, 2010), and finally to those examining its social implications (Shkabatur, 2015).

Within participatory practices in planning processes, contributions range from more general ones (King & Clifford, 1985) to those addressing sub-areas of planning in different contexts (Thompson, 2015; Fahy & Ó Cinnéide, 2009; Perkins, 2007; Wood, 2005).

Most of the references cited identify the community map as an interactive, and often incremental, process in which the inhabitants of a place reconstruct the bond between themselves and the spaces in which they live, assuming specific responsibilities not only in recognizing the identity of places but also in the concrete commitment to their preservation and/or transformation (Mannarini, 2004). Within community psychology, empirical analysis of the territory has been equipped with tools such as the community profile (Francescato & Tomai, 2002; Martini & Sequi, 1988), a form of participatory action research that interprets the local community as an integrated system of structural-objective and processual-subjective elements. Exploring the community in all its multiple dimensions broadens the participatory process, giving back the results to the community and establishing an order of priority of the problems that emerged during the mapping phase, as well as the tools for intervention. The process leading to the construction of a map, although not comparable to the full complexity of the community profile method, is essentially participatory and involves all actors, as an exercise in recognizing the values of one's community in relation to the places in which it lives (Summa, 2009; Madau, 2015). By the nature of the process and the actors involved, the context usually taken as a reference constitutes "the smallest arena" in which the social life of a community develops (Clifford, 2006). This was the case in the 1980s with the first experiences of "Parish Maps", initiated by the environmental association Common Ground, founded in West Sussex County in Great Britain, to promote and protect local distinctiveness (Leslie, 2007; Clifford, 2006; King & Clifford, 1985).

In the following years, the Parish Maps methodology was tested in many other countries (Thompson, 2015; Fahy & Ó Cinnéide, 2009; Perkins, 2007; Wood, 2005), including Italy (Esposito, 2017; Madau, 2015; Magnaghi, 2010; Summa, 2009). Here, the British model was introduced in the early 2000s, particularly within the experiences of ecomuseums (including those of IRES in Piedmont, Vernole in Apulia, Orvieto in Umbria, Cervia in Emilia

Romagna, Valle dei Laghi in Trentino-Alto Adige, and Valle di Trompia in Lombardy) to promote the role of the community in the preservation of places. Regarding the main differences between the British and Italian models, Borghi (2016) highlights both the nature of the tool and the modes of representation. In the British experience, the dimension of informality is preferred, concerning both the aims of the practices (the identification of identity and the safeguarding of the territory) and the actors involved. In the case of Italian experiences, the technical dimension of the conservation project prevails, where representation is situated at an intermediate level between artistic production (typical of British Parish Maps) and a technical analysis of a given territorial context. The direct consequence of this difference in approach can be found not only in the profile of participants in the process (ordinary people in the case of British Parish Maps versus ordinary people supported by technical experts and facilitators in the case of Italian experiences), but also in the nature of the representations: sketches, bird's-eye views, aerial perspectives, and non-scaled drawings in the first case; informal representations that are later “translated” into interdisciplinary technical documentation useful to public administration in the second case. This aspect resolves the transition from analysis to action which, for example, in the applications of the community profile method, ends with the project phase of proposals by citizens without addressing the decision-making phase (Verbena & Rochira, 2004).

In Italy, following the guidelines of the European Landscape Convention (Florence, 2000), which defines landscape as “an area, as perceived by people” (art. 1), community maps have been used in participatory practices activated in the drafting of certain regional landscape plans. Among the most significant experiences are the Territorial Landscape Plan (PPT) of Apulia (Magnaghi, 2016) and the ongoing experimentation on the island of Ischia, engaged, after the 2017 earthquake and the landslide events of 2023, in the reconstruction plan that has become an integral part of the Regional Landscape Plan (PPR) of Campania. In these cases, community maps have been used as tools for listening to and directly involving local communities. Through workshops, public meetings, and participatory laboratories, citizens were invited to represent on maps the meaningful places, areas of interest, critical issues, and potentialities of their territory. Generally, community practices in these cases develop through three main phases:

- a) detection of landscape perception, reappropriation and representation of heritage values (this phase involves the creation of the maps);
- b) participation in defining landscape quality objectives and in designing transformation scenarios;
- c) activation of local knowledge for the daily care of the landscape and the

environment, revitalization of traditional crafts and typical products, as well as cultural promotion aimed at enhancing the territory and the landscape, with a view to the future sustainable management of the Regional Territorial Landscape Plan.

These practices have made it possible to collect qualitative and subjective information that often does not emerge through traditional methods of landscape analysis. For this reason, it would be useful to integrate community psychological expertise with urban and architectural expertise to achieve pragmatic goals of change and improvement of the territory.

3. MyCamPus Lab, an interdisciplinary action for campus well-being

The MyCamPus Lab project was born out of a renewed interest within the academic community of the University of Palermo in improving quality of life, which became particularly active after the Covid-19 experience. This concern involves not only the political/technical-administrative level of university governance, committed to enhancing quality assurance processes, but increasingly also the effective interaction between this dimension of governance, the innovative teaching experiences promoted by faculty, and the independent initiatives of students, who are attentive to issues concerning the quality of university spaces.

The experiment was promoted by an interdisciplinary working group:

- for the photovoice aspects, students of Education Sciences and Pedagogical Sciences (Department of SPPEFF) were involved. At the start of the workshop, they presented the photovoice process through which the need for creating the campus map had emerged, as well as its potential, with the aim of fostering dialogue with university governance and proposing a bottom-up contribution to decision-making processes concerning spaces, their use, and enhancement;
- for the technical and digital aspects of designing the activities of MyCamPus Lab, students from the ERC SH7_8 (Land use and regional planning) and PE8_10 (Manufacturing engineering and industrial design) fields were involved. Specifically, the working group consisted of 2 senior researchers, 3 junior researchers, 10 students from the degree program in Urban Design for the City in Transition, and 20 students from the degree program in Industrial Design, all belonging to the Department of Architecture;
- 80 students from other degree programs (in particular Education Sciences, Psychological Sciences, Engineering, and Legal Sciences) then devel-

oped the map by applying in the field what had been prepared by the previous group.

The cross-fertilization and sharing of knowledge and practices from the humanities and sciences leveraged the sense of belonging to the academic community, with reference, in the first phase, to the university campus as a place and to the student community, regarded as a co-producer of innovation, ideas, and the representation of resources. With full awareness of the structural and methodological limits of the case, this was a first experimental phase of a broader and more articulated process that informally sought to initiate dialogue within a “partial” segment of the academic community (the students) and that can certainly be better structured and expanded in the future.

The experiment aimed at the general objective of fostering critical reflection on the need to take care of the socio-physical spaces of the university campus, understood as a “common good”, starting with those who experience them daily. This goal was made operational through the creation of a “community map” that involved students in responding in particular to the following needs:

- a) to contribute to strengthening the sense of belonging to the university, through the reinforcement of the community dimension;
- b) to recognize and identify the quality of the campus open spaces in order to consider them as a “common good”;
- c) to activate possible regeneration practices with particular attention to the quality of green spaces (environmental dimension).

3.1 Tools and method

Although within the limits of an experiment, the interdisciplinary profile of the working group and the different levels of expertise of the participants made it possible to explore the issue broadly and from multiple perspectives, thus facilitating the creation of a process/product that was articulated and consistent with the objectives outlined above. Senior researchers assumed the methodological and organizational coordination of the initiative; junior researchers prepared the operational actions and supported students in analysis and design activities; students from the urban planning area worked on the construction and implementation of the initial support (Google My Maps) and the final support (QGIS) of the map, while design students took care of the graphic layout and the design of the icons to be used in the mapping. Students from other disciplinary areas involved in the field acted as implementers of the community map, once they had received the technical and digital guidelines for carrying out the mapping.

The experimental application took place between March and May 2024, according to the timeline outlined below.

1. March–April 2024: design and planning of actions/activities;
 2. 06/05/23, 10/05/23, 12/05/23: student co-working sessions in the development of operational tools;
 3. 15/05/2024: experimental construction of the “community map” during the collective Community Fair event, through a crowdsourcing system for collecting geo-referenced data and photographs, using digital technologies to support the map (Google My Maps);
 4. late May 2024: construction of the GIS and analysis of the collected data.
- The experiment was structured according to the following phases:

Phase 1. Preliminary design activity. Construction of the Google My Maps base for community mapping and preparation of icons (Fig. 1) to be used for identifying the points to be mapped.

Phase 2. Community event. On May 15, 2024 (from 10:30 to 12:30), during the Community Fair, the academic community involved (around 80 students from different degree programs) took part in the community mapping activity over a period of about 2 hours, accessing the Google My Maps platform via QR code from mobile devices.

Phase 3. Data collection and cataloguing. The mapping activity took place during a “walk” inside the campus, during which students, organized independently into groups of 3 to 5, mapped the spaces they considered significant on the Google My Maps platform. The mapping was carried out as follows:

- a) *identification and selection of the place*: through discussion of the characteristics of the place, the students selected it on the map;
- b) *georeferencing*: each element was linked to its geolocated position within the campus;
- c) *cataloguing*: each element was classified as “positive”, “negative”, or “noteworthy”;
- d) *photographic production*: the students photographed the place, uploading the photo to the map;
- e) *description*: the students added a short descriptive text explaining the choice of the place and, in the case of “negative” elements, suggesting possible improvement actions.

Phase 4. Data Analysis. At the conclusion of the mapping operations, the following actions were carried out:

- a) the mapped elements were exported from Google My Maps via a KML file;
- b) the data were uploaded to QGIS, enhancing both the map and the database;
- c) at the conclusion of the work, a final report was produced with the analyzed data.

Fig. 1. System of icons created for the community map by the students of the Industrial Design degree program



3.2 First results of the project and possible future work perspectives

The community map experiment recorded approximately 1.400 mobile device accesses to the Google My Maps platform within two hours of activity. A total of 200 campus spaces were georeferenced, catalogued, photographed, and described. Of these, 68 were identified as “positive resources”, 121 as “negative elements”, and 11 as elements considered noteworthy by the participating student community. Their distribution, due to logistical reasons and walking times, is concentrated mainly in the central area of the campus (about 100 elements), while the remaining part is distributed in the North-East area (about 60 elements) and the South-West area (about 40 elements), with a generally homogeneous distribution of both “negative” and “positive”

elements. The places considered of significant interest for the whole community are concentrated mainly in the central area.

This first experiment showed how, in a relatively limited time and with the involvement of a modest number of students (80), it was possible to collect a significant amount of data and information, which produced an initial yet detailed mapping of campus areas, also allowing the identification of areas where the lack of basic services is most evident.

The collected data were structured into a report and are available, as a database, so that they can be used for future analyses and the planning of possible improvement interventions.

Fig. 2 – The mapping at the conclusion of the 15.05.2024 experiment

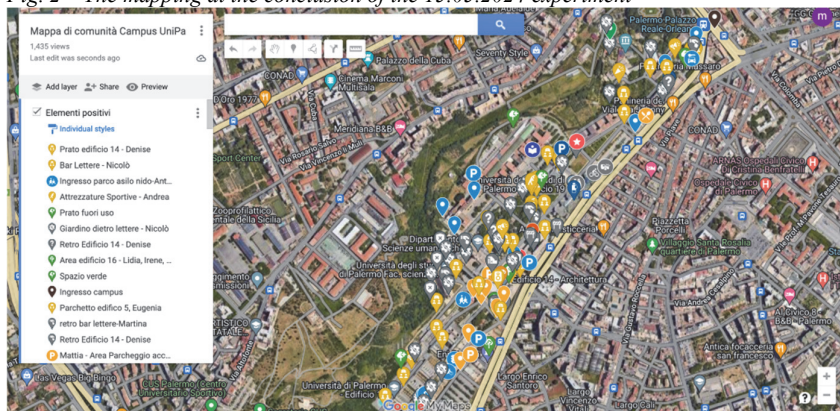


Fig. 3 – Example of a positive element mapped



On the operational level, the experiment made it possible to:

- a) the participatory construction of the community map as a collective event, through a crowdsourcing system for collecting geo-referenced data and photographs, using digital technologies to support the map (Google My Maps);
 - b) the construction of the GIS (QGIS) with the collected and processed data, stabilizing the mapping and defining the contents of the database for further technical and social uses;
 - c) the thematic analysis of the data collected during the mapping;
- the progressive use of the map in a GIS environment (QGIS), not only as a tool for interaction within the academic community, but also as a governance tool for the “participatory” planning of future campus redevelopment interventions.

More generally, the experience carried out contributed significantly, and for the first time, to the collective construction of a shared vision of the university campus by the students. Despite its experimental nature and limited application (in terms of time, places, and participants), the experience demonstrated the full potential of community mapping, both in raising awareness among the student community about caring for shared spaces and in positioning itself as an active interlocutor for possible actions to improve the quality of university life.

Extending this first experiment on a larger scale and with adequate funding could enable the initiative to become a tool for active participation and effective governance, available to the University also for the management and planning of future campus redevelopment interventions, starting from the real needs expressed by the academic community. A possible development of the initiative could involve its inclusion in one or two days per year (one per semester) dedicated to this activity, engaging the entire academic community and allowing for a more detailed and in-depth mapping of campus spaces and needs.

The MyCamPus Lab project represents a first step toward a participatory and innovative management of the university campus of the University of Palermo, with the potential to become a model of reference for other academic institutions.

4. Conclusions

The experience of constructing a community map by students on the university campus of Palermo represents a significant example of how digital technologies can enhance participatory learning, active citizenship, and a

sense of collective responsibility within an academic context. This practice, in fact, was not limited to the simple production of a cartographic representation of the territory, but took shape as a process of direct student involvement in the enhancement and protection of their study and living environment, fostering a sense of belonging and shared care for spaces. As already noted, the impact of these practices on academic effectiveness and on the well-being of all university actors is scientifically proven (Signore *et al.*, 2024; Gatti & Procentese, 2021; Peterson & Zimmerman, 2004; Peterson & Reid, 2003; Wentzel & Wigfield, 1998).

In terms of new digital technologies, the participatory use of tools such as Google My Maps and QGIS represented a key element in the success of this initiative. Google My Maps, with its intuitive interface, allowed students to easily map spaces by adding points of interest, routes, images, and comments, thus fostering a collaborative approach, first within small groups and then within the larger group of Community Fair participants. The platform, in fact, facilitated immediate “construction” and sharing, stimulating dialogue among participants and strengthening the sense of digital community. The ability to view and update information in real time made the experience more dynamic and engaging.

On the other hand, QGIS, with its advanced functionalities for geographic analysis and spatial data management, enabled students to explore more technical and scientific aspects related to territorial representation. This tool fostered a more rigorous and detailed approach in the construction of the community map, stimulating skills of analysis, interpretation, and synthesis of geographic information. The use of QGIS also promoted greater awareness of territorial and environmental dynamics, contributing to the development of a critical and responsible understanding of the campus.

The integration of these digital technologies within a theoretical framework rooted in community psychology had a significant impact on strengthening active citizenship practices within the academic community, which thus acts as a community of practice fostering the growth of individuals and the collective. Through participation in the construction of the map, students were called upon to recognize and enhance campus resources, to identify critical issues, and to propose shared solutions both among themselves and with the governance system. The possibility of integrating geographic data, images, and personal and collective narratives through digital technologies enriched the representation of the campus, making it more vivid, meaningful, and closely connected to students’ daily experiences. The process, as much as the goal, of constructing and sharing the community map thus proves to be a tool of personal, organizational, and community empowerment (Shkabatur, 2014; Maton, 2008; Chambers, 2005; Zimmermann, 2000; Kieffer, 1984),

through which processes of co-decision-making on intervention priorities can be built, making the power system as participatory as possible, both horizontally and vertically, for the well-being of the university community.

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Digital game design for sustainable mobility: a community approach to behavioural transformation in onlife urban environments

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Abstract

This research presents a case study examining how transformational game design promotes sustainable mobility through community psychology approaches in onlife environments. The MUV platform¹, developed as University of Palermo spinoff, demonstrates practical integration of behavioural change models with game design principles. Longitudinal data from 2,856 users across European cities show 33.8% average carbon footprint reduction, with 14.9% daily-to-monthly active user retention. The platform's sport-as-metaphor framework transforms routine mobility decisions into engaging activities whilst supporting empowerment and social equality. Findings establish that university-led digital innovations can achieve meaningful individual and collective behavioural change, providing replicable pathways for scaling community psychology interventions addressing climate challenges.

Keywords: game design, sustainable mobility, community psychology, behavioural change, digital transformation, university innovation.

Riassunto. *Progettazione di giochi digitali per la mobilità sostenibile: un approccio comunitario alla trasformazione comportamentale negli ambienti urbani Onlife*

Questa ricerca presenta un caso studio che esamina come il game design trasformativo promuova comportamenti di mobilità sostenibile attraverso approcci di psicologia di comunità negli ambienti onlife. La piattaforma MUV, sviluppata come spinoff dell'Università di Palermo, dimostra l'integrazione pratica di modelli di cambiamento comportamentale con principi di game design. I dati longitudinali di 2.856 utenti in città europee mostrano una riduzione

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media dell'impronta carbonica del 33,8%, con il 14,9% di retention utenti attivi giornaliere/mensili. Il framework sport-come-metafora della piattaforma trasforma le decisioni di mobilità routinarie in attività coinvolgenti, supportando empowerment ed equità sociale. I risultati stabiliscono che le innovazioni digitali guidate dalle università possono ottenere cambiamenti comportamentali significativi individuali e collettivi, fornendo percorsi replicabili per scalare interventi di psicologia di comunità nell'affrontare le sfide climatiche.

Parole chiave: game design, mobilità sostenibile, psicologia di comunità, cambiamento comportamentale, trasformazione digitale, innovazione universitaria.

1. Introduction

The contemporary urban landscape is increasingly characterised by what Floridi (2014) defines as onlife environments, hybrid spaces where the boundaries between online and offline experiences become blurred, creating new contexts for human interaction and decision-making. Digital technologies permeate daily mobility choices within these environments, transforming how individuals navigate urban spaces and make transportation decisions. Examples include ride-sharing applications like Uber and Lyft that influence modal choice decisions, navigation apps such as Google Maps that shape route preferences, and bike-sharing platforms like Citybike that affect micro-mobility adoption patterns (Shaheen & Cohen, 2019; Djavadian and Chow, 2017). This digital transformation presents unprecedented opportunities for behavioural intervention, particularly through community psychology approaches that recognise the interconnected nature of individual actions and collective well-being.

The transport sector represents one of the most polluting industries, accounting for approximately one quarter of global greenhouse gas emissions, with over 60% attributable to private vehicles (International Energy Agency, 2021). Traditional approaches promoting sustainable transportation through policy interventions, infrastructure development, or economic incentives often fail to address the psychological and social dimensions of behavioural change, overlooking the complex interplay between individual motivation, social norms, and environmental constraints.

Community psychology offers a distinctive perspective on this challenge by emphasising the reciprocal relationship between individuals and their social environments. Rather than focusing solely on individual behaviour modification, community psychology interventions seek to create systemic changes that support collective well-being whilst empowering individuals to make meaningful choices (Kloos *et al.*, 2020). This approach is particularly relevant in addressing mobility behaviours, which are inherently social phe-

nomena influenced by community norms, infrastructure availability, and collective action towards environmental sustainability (Nielsen *et al.*, 2021; Bamberg *et al.*, 2015).

1.1 Digital tools and community psychology frameworks

Within onlife environments, mobile applications mediate transportation decisions while social media platforms shape perceptions of mobility options and environmental responsibility. However, the proliferation of digital mobility services has introduced new challenges: decision fatigue from abundant choices, superficial gamification prioritising engagement over genuine change, and digital divides creating inequities in access to sustainable options, particularly affecting vulnerable populations including elderly users, low-income communities, and individuals with limited technological literacy (Martens, 2016; Lupton, 2015).

Community psychology's ecological perspective provides a framework for understanding how digital interventions can promote sustainable mobility behaviours at multiple levels simultaneously. Bronfenbrenner's (1979) ecological systems theory suggests that behavioural change occurs through interactions between individual characteristics and environmental systems. Digital platforms offer unique opportunities to influence these levels by creating virtual communities, facilitating social comparison, and providing realtime feedback about collective environmental impacts.

The empowerment principle is particularly relevant to digital mobility interventions. Research demonstrates that effective digital empowerment requires user agency in data control, meaningful participation in platform governance, and transparent algorithms that respect user autonomy (Van Dijk, 2020; Ragnedda & Muschert, 2013). Effective interventions should enhance individuals' capacity to make informed choices and contribute to collective goals, requiring digital experiences that respect user autonomy while providing clear information about the consequences of mobility choices for personal and community well-being.

1.2 Game design as transformational tool

Game design principles offer powerful tools for creating digital interventions that align with community psychology values. Unlike traditional gamification that overlays game elements onto existing activities, transforma-

tional game design creates entirely new interaction paradigms, making sustainable choices inherently rewarding and meaningful (McGonigal, 2011). The sport metaphor in digital interventions has proven particularly effective in health and environmental contexts, as it naturally combines individual achievement with collective goals while maintaining intrinsic motivation through competence development and social connection (Hamari *et al.*, 2014; Seaborn and Fels, 2015).

Games naturally create “flow” experiences characterised by deep engagement, intrinsic motivation, and optimal challenge levels (Csikszentmihalyi, 1990). They uniquely bridge individual and collective action by creating shared experiences and common goals, fostering collective efficacy – the belief that groups can effectively achieve goals together (Bandura, 2000). This characteristic makes game design particularly suited to addressing environmental challenges requiring coordinated collective action.

The following sections explore how these theoretical foundations integrate into practical digital interventions for sustainable mobility, using the MUV platform¹ as a case study of university-led innovation in transformational game design.

2. Theoretical framework

Designing effective digital interventions for sustainable mobility requires a comprehensive understanding of behavioural change mechanisms and psychological principles underlying human motivation. This section examines theoretical foundations informing game-based approaches to mobility transformation, exploring how established behavioural models integrate with innovative design strategies to create meaningful change in urban transportation patterns.

Contemporary behavioural science offers robust frameworks for understanding and facilitating behaviour change, each providing unique insights into the complex dynamics of human decision-making (Michie *et al.*, 2014; Prochaska and Velicer, 1997; Ajzen, 1991). When applied to mobility contexts, these models reveal the multifaceted nature of transportation choices and highlight the potential for digital interventions to address multiple determinants simultaneously.

¹ MUV platform website: <https://www.muvgame.com>. The platform provides gamified tools for sustainable mobility tracking and community engagement.

2.1 Behavioural change models for digital interventions

Three theoretical models provide valuable frameworks for designing digital mobility interventions: the Behaviour Change Wheel (BCW), Fogg's Behaviour Model (FBM), and Self-Determination Theory (SDT). Each offers distinct perspectives on behavioural change mechanisms while complementing others in creating comprehensive intervention strategies.

The Behaviour Change Wheel (Michie *et al.*, 2011) provides a systematic approach to designing interventions based on three core components: capability (physical and psychological capacity to perform behaviour), motivation (psychological and amotional factors influencing action, including reflective processes and habits), and opportunity (external factors, such as infrastructure availability, social norms, and environmental cues, that facilitate or constrain behaviour).

Fogg's Behaviour Model focuses on the precise moment when behaviours occur. According to FBM, behaviour happens when three factors converge simultaneously: sufficient motivation, adequate ability, and effective prompt (Fogg, 2009). This model emphasises timing and context in behavioural interventions. Mobile applications are uniquely positioned to deliver prompts at optimal moments, such as when users plan journeys or make real-time transportation decisions.

Self-Determination Theory focuses on psychological needs supporting intrinsic motivation and sustained behavioural change. SDT identifies three basic needs: autonomy (feeling volitional and self-directed), competence (feeling effective and capable), and relatedness (feeling connected to others) (Deci & Ryan, 1985, 2000). Interventions supporting these needs foster intrinsic motivation, which is associated with greater persistence than behaviours driven by external rewards.

2.2 From habit loops to game loops: neurological Foundations

Understanding the neurological basis of habit formation provides crucial insights for designing effective game-based interventions. Habits operate through a documented neurological cycle: cue, routine, and reward (Duhigg, 2012). This cycle becomes increasingly automatic through repetition, as neural pathways strengthen and conscious effort decreases. Importantly, anticipation of reward drives motivational power in established habits.

Game loops share striking structural similarities with habit loops, suggesting games can be powerful tools for habit formation and modification (Schell, 2014). Games rely on the cyclical structure of challenge, reward, and

expansion phases. Players engage with challenges that, upon completion, yield rewards. These rewards unlock new opportunities, enabling skill development and progression. The anticipation phase between reward and expansion is marked by dopamine release, creating a neurochemical foundation for sustained engagement (McGonigal, 2011).

The conceptual alignment between habit and game loops provides a scientific foundation for using game design principles in behavioural interventions. By designing challenge-reward cycles that mirror neurological patterns underlying habit formation, games can potentially accelerate the development of sustainable mobility habits.

2.3 Transformational games versus traditional gamification

The distinction between *transformational games* and traditional gamification approaches is crucial for understanding game design potential in promoting sustainable mobility behaviours. Traditional gamification typically overlays game elements such as points and badges onto existing activities without fundamentally altering the underlying experience or addressing deeper motivations for behavioural change.

Transformational games are designed to generate profound individual and collective changes by reshaping beliefs, values, and behavioural patterns. As Bogost (2007) argues, games can serve as persuasive media that embed real-world logics into game mechanics, creating experiences that naturally guide players towards desired outcomes.

Purpose-oriented play represents the first defining characteristic, where gameplay transcends entertainment to address specific societal goals. Empowerment constitutes the second characteristic, as transformational games equip players with tools, knowledge, and motivation to achieve personal and collective goals. Real-world impact defines the third characteristic, where ingame actions translate into tangible outcomes beyond the game environment.

The online multiplayer game *Eco* exemplifies transformational environmental game design (Strange Loop Games, 2018; Squire and Jenkins, 2003). Players collaborate to build a sustainable civilisation within a reactive ecosystem where every action affects the entire world, requiring careful resource management to avoid environmental collapse. With over 250000 engaged players, *Eco* demonstrates how games can create intrinsic motivation for environmental stewardship by making sustainable behaviour essential for collective success, while system-level feedback helps players understand how individual actions aggregate into collective outcomes.

The theoretical frameworks examined provide a foundation for developing comprehensive digital interventions addressing psychological, social, and neurological dimensions of behavioural change. The following section explores how these principles have been applied in developing the MUV platform, demonstrating practical integration of behavioural science and transformational game design.

3. The MUV case study: evidence from longitudinal implementation

The MUV (Mobility Urban Values) platform represents a paradigmatic example of university-led technological innovation addressing pressing societal challenges through evidence-based design. Developed as a spinoff from the University of Palermo, MUV demonstrates the practical application of theoretical frameworks examined previously, integrating behavioural science principles with transformational game design to create a comprehensive intervention for sustainable urban mobility.

The platform functions by tracking users' transportation choices through GPS and device sensors, converting sustainable mobility behaviours (walking, cycling, public transport use) into game points within a sport-like competitive framework. Users form teams representing neighborhoods, companies, or social groups, competing in tournaments where collective environmental performance determines success. Real-time feedback shows individual and team carbon footprint reductions, while social features enable sharing achievements and strategies with community members.

MUV operates at the intersection between habit and game loops, converting routine mobility decisions into engaging experiences through carefully designed mechanics. The platform fundamentally reimagines urban transportation as a collective sporting activity, transforming how users perceive daily travel choices. This approach exemplifies universities' role in fostering innovation that bridges academic research with real-world impact.

A distinctive methodological feature is MUV's integration of rigorous scientific measurement with practical market deployment. The platform's CO₂ emission reduction methodology has been validated by RINA in accordance with ISO 14064-2 standards (ISO, 2019), ensuring environmental impact claims meet international scientific standards while supporting commercial sustainability goals.

3.1 Platform design and game mechanics

MUV's architectural design reflects a sophisticated understanding of behavioural change mechanisms², integrating multiple theoretical frameworks into a cohesive user experience, promoting sustainable mobility through intrinsic and extrinsic motivations. The platform employs a multi-layered approach addressing capability, motivation, and opportunity simultaneously, following the BCW framework.

The primary innovation lies in the systematic application of sport as a metaphor for sustainable mobility transformation. This approach builds upon extensive research demonstrating that sport metaphors effectively enhance motivation, goal-setting, and social engagement in behavioural interventions (Burke *et al.*, 2015; Consolvo *et al.*, 2008). The sport framework fundamentally reframes the entire mobility experience within a coherent athletic paradigm, addressing a critical gap in mobility behavioural interventions: transforming routine, unconscious travel decisions into conscious, motivated choices.

Sport naturally integrates the three psychological needs identified in SDT: autonomy (choice in participation modes), competence (progressive skill development), and relatedness (team membership and competition) (Ryan & Deci, 2017; Ntoumanis *et al.*, 2021).

The sport-as-metaphor operationalises through narrative transformation where individual trips become “performance”, modal choices represent different “disciplines”, communities form “teams” with shared performance goals, and environmental impact becomes measurable “athletic achievement”. This conceptual reframing activates intrinsic motivational drivers and reduces psychological resistance by shifting focus from environmental duty to personal mastery and collective success.

MUV's multi-modal gamification architecture accommodates diverse transport modes within a unified competitive framework. The architecture incorporates hierarchical point systems reflecting actual environmental impact rather than arbitrary mechanics, with scoring algorithms incorporating modespecific sustainability coefficients validated against ISO standards. Walking and cycling receive higher point values, public transport receives moderate scores, and private vehicle use receives less points, creating clear incentive structures aligned with environmental objectives.

Progressive competition structures systematically build from individual habit formation through peer competition to complex team dynamics. Users

² The MUV platform is available for download on iOS and Android app stores, with implementations currently active in multiple European cities.

engage through individual training sessions focused on personal improvement, peer-based challenges activating social motivation, or team-based tournaments featuring strategic coordination. This progression maintains user autonomy over participation intensity while providing clear pathways for increased engagement.

3.2 Community psychology principles implementation

MUV's implementation demonstrates how digital platforms can effectively address multiple levels of behavioural intervention simultaneously through evidence-based design principles (Trickett, 2009; Wandersman and Florin, 2003). The platform's design reflects Bronfenbrenner's (1979) ecological systems theory by creating interventions spanning individual, interpersonal, community, and societal levels.

At the individual level, MUV supports three basic psychological needs through carefully designed choice architectures based on established behavioural economics principles (Thaler & Sunstein, 2008). Autonomy is fostered by maintaining complete user control over participation timing, intensity, and competitive involvement. The voluntary tracking system requires deliberate activation, ensuring sustainable choices feel self-directed. Competence development occurs through progressive architecture, enabling users to develop mastery through increasing challenge complexity. Relatedness is cultivated through team structures, social leaderboards, and collaborative challenges, creating multiple pathways for social connection.

At interpersonal and community levels, MUV facilitates social influence processes that shift norms around mobility choices through mechanisms established in social psychology research (Cialdini and Goldstein, 2004; Schultz *et al.*, 2007). The platform makes sustainable behaviours visible through social feeds and leaderboards, creating opportunities for social modelling. Community-level interventions are implemented through neighbourhood and city-wide competitions, creating collective goals and shared identity around environmental sustainability.

The platform's integration with existing mobility infrastructure operates as a motivational enhancement layer that complements rather than replaces available transport options. This infrastructure-agnostic approach ensures broad applicability while focusing on behavioural transformation rather than technological dependency.

3.3 Measurable impacts: individual and collective outcomes

Through implementation across multiple European cities, MUV has generated substantial evidence of effectiveness in promoting sustainable mobility behaviours. Longitudinal data collected between 2022-2024 from all community implementations (2,856 active users) demonstrated that participants reduced their mobility-related carbon footprint by an average of 33.8% compared to personal baselines. This substantial reduction reflects the capacity of behavioural interventions to drive meaningful environmental change without requiring policy restrictions or infrastructure modifications.

Behavioural change penetration rates vary substantially (19.20-39.18%), with an overall average of 31.29% of active participants achieving measurable emission reductions. Penetration rates demonstrate an inverse relationship with reduction magnitude, suggesting broader participation involves more modest individual changes, while focused engagement generates more profound behavioural transformation. This finding has important implications for scaling strategies, indicating platforms can simultaneously achieve broad reach and deep impact through differentiated engagement pathways.

From an engagement perspective, the platform achieved a Daily Active Users to Monthly Active Users (DAU/MAU) ratio of 14.9% over the 2022-2024 period, indicating strong user retention typical of successful mobile applications. The presence of active competitions correlated with a 41.84% increase in user participation, confirming the effectiveness of game dynamics in sustaining long-term engagement beyond initial novelty effects.

The platform's dual approach, combining bottom-up behavioural change with top-down policy formulation, establishes a reinforcing loop where individual actions inform systemic improvements. Mobility data collected serves multiple purposes: reinforcing intrinsic motivations by visualising personal progress, enabling organisations to develop evidence-based mobility management plans, and providing insights for urban mobility policies and Sustainable Urban Mobility Plans (SUMP) (European Commission, 2019).

Digital literacy improvements represent an important secondary outcome, particularly relevant to supporting healthy technology use patterns among diverse user populations. Users demonstrate enhanced confidence with mobile technology and improved understanding of privacy and data management issues, supporting digital inclusion in increasingly technology-mediated urban environments.

At the collective level, MUV's success in engaging diverse demographic groups provides evidence of potential for promoting equitable access to sus-

tainable mobility benefits. The platform's design effectively addresses barriers that might otherwise limit access to sustainable transportation options, ensuring interventions do not exacerbate urban inequalities.

The empirical validation successfully transitioned from research prototype to commercial implementation through MUV Srl SB, established in 2020 to transform theoretical principles into market-viable solutions. This transition demonstrates how university-led innovation can create a lasting impact beyond academic research, establishing sustainable pathways for scaling evidence-based interventions to address societal challenges.

4. Discussion: critical analysis and implications

The MUV case study provides valuable insights into the potential and limitations of game-based approaches to sustainable mobility, offering a foundation for critical assessment of transformational game design as a community psychology intervention (Trickett, 2009; Kloos *et al.*, 2020). This analysis examines the strengths and constraints of the approach, explores broader implications for community psychology practice, and considers the distinctive role universities can play in developing technology-mediated social interventions.

4.1 Critical assessment of the game design approach

The sport-as-metaphor framework demonstrates both significant potential and important limitations as a behavioural change mechanism. The approach's primary strength lies in its ability to reframe environmental responsibility from moral obligation to skill-based achievement, reducing psychological resistance and maintaining intrinsic motivation (Ryan & Deci, 2017; Deci & Ryan, 2012). The 33.8% average carbon footprint reduction suggests this reframing can produce meaningful behavioural change when appropriately implemented.

However, several contextual factors influence the framework's effectiveness. The inverse relationship between participation breadth (19.20-39.18% penetration rates) and reduction magnitude indicates that universal applicability may be limited. The sport metaphor may resonate differently across cultural contexts where competitive athletics hold varying social significance (Hofstede, 2001). Additionally, the approach's effectiveness appears dependent on existing community social capital and technological infrastructure, potentially limiting scalability in resource-constrained environments.

The game design approach also raises questions about long-term sustainability beyond active platform engagement. While the 14.9% DAU/MAU ratio demonstrates sustained engagement, the research has not yet established whether behavioural changes persist after users discontinue platform use or whether the approach facilitates genuine habit formation versus temporary compliance with game mechanics (Gardner, 2015; Wood and Neal, 2007).

Comparison with alternative behavioural change approaches reveals both advantages and trade-offs. Traditional policy interventions offer broader reach but lower engagement levels, while purely educational approaches may enhance awareness without producing behavioural change (Stern, 2000; McKenzieMohr, 2011). The MUV approach occupies a middle ground, achieving adequate reach with substantial impact among engaged users, suggesting complementary rather than replacement value within comprehensive sustainability strategies.

4.2 Broader implications for community psychology practice

The MUV case study demonstrates how digital platforms can extend community psychology principles into new domains while raising questions about integrating technology-mediated and traditional community-based interventions (Kloos *et al.*, 2020; Trickett, 2009). The platform's success in addressing multiple ecological levels simultaneously suggests that well-designed digital tools can indeed facilitate systemic change, challenging assumptions that technology-mediated interventions necessarily focus on individual behaviour modification.

The empowerment framework's application to digital contexts reveals both opportunities and tensions (Zimmerman, 2000; Perkins & Zimmerman, 1995). While the platform successfully supports autonomy, competence, and relatedness through choice architectures and social features, questions remain about whether digital empowerment translates into broader community capacity for addressing non-technology-mediated challenges. The 41.84% increase in participation during competitions suggests that digital engagement can mobilise collective action, but the sustainability of this mobilisation beyond the gaming context requires further investigation.

The approach's transferability to other social challenges presents both promise and complexity (Wandersman & Florin, 2003). Mental health promotion, social integration, and civic engagement could potentially benefit from similar game-based reframing strategies. However, each domain pre-

sents unique ethical considerations, cultural sensitivities, and outcome measurement challenges that would require careful adaptation of the fundamental approach.

Integration with traditional community psychology methods remains an underexplored area requiring systematic investigation (Trickett, 2009). Digital platforms could potentially serve as engagement mechanisms that facilitate subsequent face-to-face community development work or as data collection tools that inform traditional intervention design. Alternatively, they might function as standalone interventions that complement but do not require integration with traditional approaches.

4.3 Universities as innovation hubs for social change

The University of Palermo's role in supporting MUV's development illustrates a distinctive model for academic engagement with societal challenges that extends beyond traditional research dissemination (Boyer, 1990; Sandmann *et al.*, 2008). The transition from research prototype to sustainable business model demonstrates how universities can create a lasting impact while maintaining a commitment to social benefit rather than profit maximisation.

This approach addresses a critical gap in translating community psychology research into scalable practice (Trickett, 2009; Wandersman, 2003). Traditional academic publishing rarely produces interventions with the reach and sustainability necessary to address systemic social challenges. The university led social enterprise model provides an alternative pathway that preserves scientific rigour whilst enabling real-world implementation and continuous improvement based on empirical feedback.

The interdisciplinary collaboration required for MUV's development, integrating environmental psychology, game design, computer science, and urban planning, exemplifies universities' unique capacity to facilitate knowledge synthesis across traditional departmental boundaries (Klein, 2008; Lattuca, 2001). This collaborative capacity may be essential for addressing complex social challenges that resist single-discipline solutions.

However, the model also presents challenges and limitations. The transition from academic research to commercial sustainability requires expertise in business development, legal structures, and market dynamics that may not align with traditional academic career pathways (Sandmann *et al.*, 2008; Boyer, 1990). Additionally, maintaining community psychology values while scaling interventions through commercial mechanisms requires careful governance structures and ongoing accountability measures.

The social benefit corporation model adopted by MUV Srl SB provides one framework for addressing these tensions, but broader institutional changes may be necessary to support university-led social innovation systematically. Academic promotion and tenure systems, funding mechanisms, and performance metrics would need adaptation to recognise and reward this form of engaged scholarship effectively (Glassick *et al.*, 1997; Boyer, 1990).

5. Conclusions and future directions

This research examined how transformational game design can serve as an effective tool for promoting sustainable mobility behaviours within onlife urban environments, using the MUV platform as a paradigmatic example of university-led innovation in community psychology intervention. The findings establish that digital technologies, when designed with explicit attention to community psychology principles, can achieve meaningful behavioural change at both individual and collective levels while supporting empowerment and social equity.

The theoretical integration of behavioural change models with transformational game design provides a robust framework for developing digital interventions addressing complex, multi-level determinants of sustainable mobility. The sport-as-metaphor approach demonstrates how strategic reframing can transform routine transportation decisions into engaging, skill-based activities that reduce psychological resistance whilst building genuine competence. Empirical evidence of 33.8% average carbon footprint reduction confirms the scalability and effectiveness of this approach.

The university's role in developing MUV exemplifies how academic institutions can bridge theoretical knowledge and practical application while maintaining a commitment to social benefit and scientific rigour. The platform's progression from research prototype to sustainable business model provides a replicable pathway for translating community psychology research into scalable interventions addressing pressing societal challenges.

Future research should examine several critical areas to advance understanding game-based community psychology interventions (Kloos *et al.*, 2020; Trickett, 2009). Long-term sustainability studies are essential to determine whether behavioural changes persist beyond active platform engagement and whether they generalise to other pro-environmental behaviours. Crosscultural validation of game-based frameworks requires systematic testing across diverse cultural contexts to ensure universal applicability whilst respecting cultural sensitivities.

Methodological innovations should explore optimal integration of digital

platforms with traditional community psychology approaches, investigating how technology-mediated interventions can complement face-to-face community development work (Wandersman & Florin, 2003). Research on governance models for university-led social enterprises could inform broader efforts to scale evidence-based interventions whilst maintaining community psychology values.

Applications to other social challenges represent a promising avenue for expanding community psychology's impact in digital contexts. Mental health promotion, social integration, and civic engagement could benefit from similar game-based empowerment approaches, contributing to the growing field of digital community psychology (Doherty & Doherty, 2018; Mohr *et al.*, 2013).

As communities worldwide navigate challenges of climate change and digital transformation, this research provides evidence that university-led innovation in transformational game design can create technology-mediated interventions that enhance rather than compromise psychological well-being and social cohesion. The MUV platform demonstrates that digital technologies developed with community psychology principles can serve as powerful tools for addressing global challenges while supporting local empowerment and collective action towards a sustainable future.

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