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Original
Supporting Young People Digital Awareness through Novel Interactive Systems / Scibetta, L.. - ELETTRONICO. - (2026), pp. 1-5. (CHI conference on Human Factors in Computing Systems Barcelona (ES) 13-17/04/2026) [10.1145/3772363.3799217].

Availability:
This version is available at: 11583/3010250 since: 2026-04-24T19:31:13Z

Publisher:
ACM

Published
DOI:10.1145/3772363.3799217

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29 November 2026

Supporting Young People Digital Awareness through Novel Interactive Systems

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Abstract

Nowadays, smartphones are increasingly pervasive, and many people struggle to find a healthy balance in their technology use. This challenge is particularly evident among young people. Existing tools supporting digital self-control have shown limited effectiveness in fostering long-term autonomy, highlighting the need for innovative and more impactful solutions. My research investigates the design of interactive systems aimed at enhancing young people's awareness of their digital practices, with the goal of supporting healthier digital habits. My work explores two key dimensions: individual versus group-based interventions, and ludic versus non-ludic approaches. This dual perspective allows comparison of different design strategies and assessment of their effectiveness across diverse populations. To date, the research has examined several interventions, including an educative system for digital wellbeing education at school and an AI-assisted goal-oriented tool guiding users through a personalized self-reflection path. Future work will further explore new approaches to support young people's digital wellbeing.

CCS Concepts

• **Human-centered computing** → **Smartphones**; *User studies*; *Empirical studies in HCI*.

Keywords

Digital Wellbeing, Smartphone Overuse, Personalized Interventions

ACM Reference Format:
Luca Scibetta. 2026. Supporting Young People Digital Awareness through Novel Interactive Systems. In *Extended Abstracts of the 2026 CHI Conference on Human Factors in Computing Systems (CHI EA '26), April 13–17, 2026, Barcelona, Spain.* ACM, New York, NY, USA, 5 pages. https://doi.org/10.1145/3772363.3799217

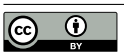
1 Introduction and Background

Today's world is characterized by the increasing and pervasive presence of smartphones among people of every age. People can perform a wide range of activities on their smartphones, spanning from studying and work-related tasks to social media use and leisure activities. Although these uses of technology can improve people's lives, they also introduce the critical question of to what extent smartphones are actually useful and when, instead, they become a distraction that prevents people from achieving objectives or simply feeling well and in control. This issue largely stems from the fact that many digital platforms adopt the so-called "attention economy" as their business model [2]. Since registration and usage are typically free, platforms generate revenue by capitalizing on users' attention. Consequently, people often experience losing track of time and control, miss real-life social experiences due to excessive phone use and feel regret [18]. The concept of digital wellbeing has been introduced and studied in relation to these previous criticalities and, although there are many slightly different definitions, I will refer to it as what can contribute to maintain an healthy balance when using technology.

Researchers and practitioners have extensively focused on how to help people regain autonomy over their smartphone usage through Digital Self-Control Tools (DSCTs). These systems pursue objectives ranging from enabling users to monitor time spent on devices and applications, to allowing them to self-impose blocks and timers to prevent excessive use. However, these solutions introduces new critical issues: many of them adopt one-size-fits-all strategies that fails to address individual needs [15]. Moreover, users are often required to rely entirely on these tools to regulate their behavior, undermining their goal of regaining autonomy. In this regard, it is also notable that in most DSCTs a "detachment phase", guiding users through progressively abandoning the intervention while maintaining the acquired habits, is often not properly considered.

More recently, the concept of digital wellbeing education has gained attention. Given the limited effectiveness of the corrective approach represented by DSCTs, several studies have explored whether educating users about digital wellbeing can help them achieve better control over smartphone use. However, current educational strategies have targeted university [10, 12] or high school students [11], for whom digital habits may have already formed. It remains unclear whether better outcomes could be achieved by targeting different age groups or by extending and adapting digital wellbeing educational pathways.

In addition, both aforementioned approaches often lack validation over longer periods of time, necessary to assess whether actual habit changes have occurred. It is also not always evident whether tools and interventions are grounded in established psychological theories, such as Self-Determination Theory (SDT) [4] or Dual-System Theory [9], that may positively contribute to their effectiveness [14]. These considerations highlight the need for new solutions that account for different target age groups and adaptation to users and contexts to provide better support in managing smartphone usage.



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CHI EA '26, Barcelona, Spain
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ACM ISBN 979-8-4007-2281-3/2026/04
https://doi.org/10.1145/3772363.3799217

2 Research Approach

In my research, I focus mainly on young people, spanning from children to young adults, and considering specific contexts where digital intervention can be adopted. Hence, I have been guided by the following research questions.

- **RQ1:** In which ways is it possible to design interactive systems that can effectively result in positive habit change?
- **RQ2:** How can different target groups, situated in different contexts, be supported in an appropriate manner?

Incorporating ludic elements may be beneficial to better engage young people. These elements can serve both as an entry point to discover digital wellbeing engagingly and as a means to sustain interest over time, enabling longer interventions [1, 20]. Accordingly, I introduce the first dimension along which my work is structured. My research spans from fully ludic approaches, such as games, to gamification for behavior-change, and non-ludic approaches focusing on solution-oriented strategies.

Another important aspect to consider is the social dimension of interventions. The perspective shift from digital wellbeing as an individual issue to a societal one emerges from the literature [5] and it is yet to verify if an approach of this type may encourage people collaboration and support to improve each others technology use. Existing tools, such as Lock n Lol [7], already target groups of users, although they focus on smartphone blocking. Similarly, digital wellbeing education has targeted groups or classes of students [10, 11]. So, it is possible to envision solutions that target groups of friends or classes to foster positive change collectively. However, it is not granted that social stimulation is effective for everyone. Therefore, a second dimension need to be acknowledged in my work, spanning from individual solutions to group-based tools, including combining or alterning both modalities.

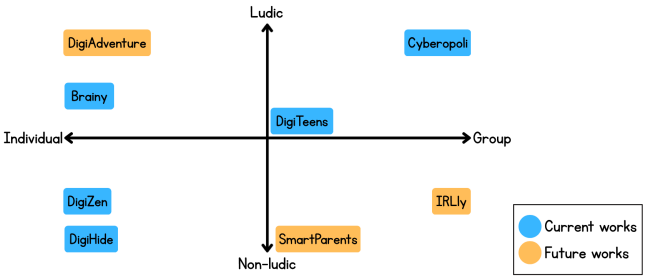


Figure 1: Distribution of current and future works over the identified dimensions.

3 Contributions to Date

As shown in Figure 1, my current contributions are spread across the two dimensions identified in the previous section, with the aim of addressing multiple aspects and evaluating which approaches are most effective for different target groups and contexts. In this section, I describe each of these solutions.

3.1 DigiZen

As discussed in Section 1, current DSCTs often lack effectiveness due to limited customization and consideration of the detachment phase. Given the increasing capabilities of Large Language Models (LLMs) in recent years, it is possible to augment traditional DSCTs with LLMs to address these limitations and develop more effective tools. These considerations led to DigiZen, a tool that accompany users on an personalized path toward digital wellbeing. As a first step, I investigated whether LLMs are currently able to understand digital-wellbeing-related concepts and adapt to specific contexts and needs of users. This was explored through a study involving four user personas, constructed from SDT and common triggers of problematic digital usage identified in the literature[8, 18, 19], each interacting with four different LLMs [3]. Building on the overall positive findings, I conducted a PRISMA [13] Systematic Literature Review on AI-powered applications that support digital wellbeing. This review led to a design framework which serve as a structured guide for the design and evaluation of AI-powered digital wellbeing applications [17]. These preparatory steps, eventually, informed the design of DigiZen. The app rely on ChatGPT APIs to guide users through a personalized and adaptive digital wellbeing improvement journey in four phases. During the first, the system focuses on understanding users' goals and habits. Based on this, the second phase provides targeted daily microgoals that push for healthier digital habits. These microgoals to reach (Figure 2b), together with the progress bars (Figure 2a), constitute the only gamification elements of the system, making DigiZen mostly non-ludic. In the subsequent phase, the system continues to offer support without microgoals, with the aim of fostering autonomy. In the final phase, users are invited to reflect on whether they have achieved their goals, wish to pursue new objectives, or feel satisfied enough to uninstall the application. The duration of each phase depends on users' progress and their willingness to transition to the next phase when ready. This adaptive approach has undergone an initial 10-day in-the-wild evaluation with 15 participants, yielding positive user feedback. However, as previously noted, assessing persistent habit change requires longer-term evaluation. Hence, I am currently working on a second evaluation phase with a planned duration of several months, aimed at assessing the effectiveness of the DigiZen approach.

3.2 DigiTeens

The DigiTeens system [16] targets high school students. Evidence shows that such a group of users may deeply benefit from educative interventions [6]. Hence, the system aims to introduce digital wellbeing education directly within the everyday school environment, mediated by teachers as digital wellbeing educators. The system provides them with a set of activities inspired by the scientific literature, which can be organized into a customized educational pathway through a dedicated web application, also offering class-level results and theoretical support to stimulate in-class discussion. Students are provided with a mobile application featuring several gamification elements designed to stimulate participation and engagement. Through this application, they can take part in the activities of the teacher-created pathway (Figure 2c) and view a virtual class of avatars (Figure 2d), customizable using in-app currency in the application's shop. This approach primarily focuses on knowledge transfer and reflective practices but is highly gamified. At the same time, the system is divided between individual and group-based activities: many activities can be conducted either individually or

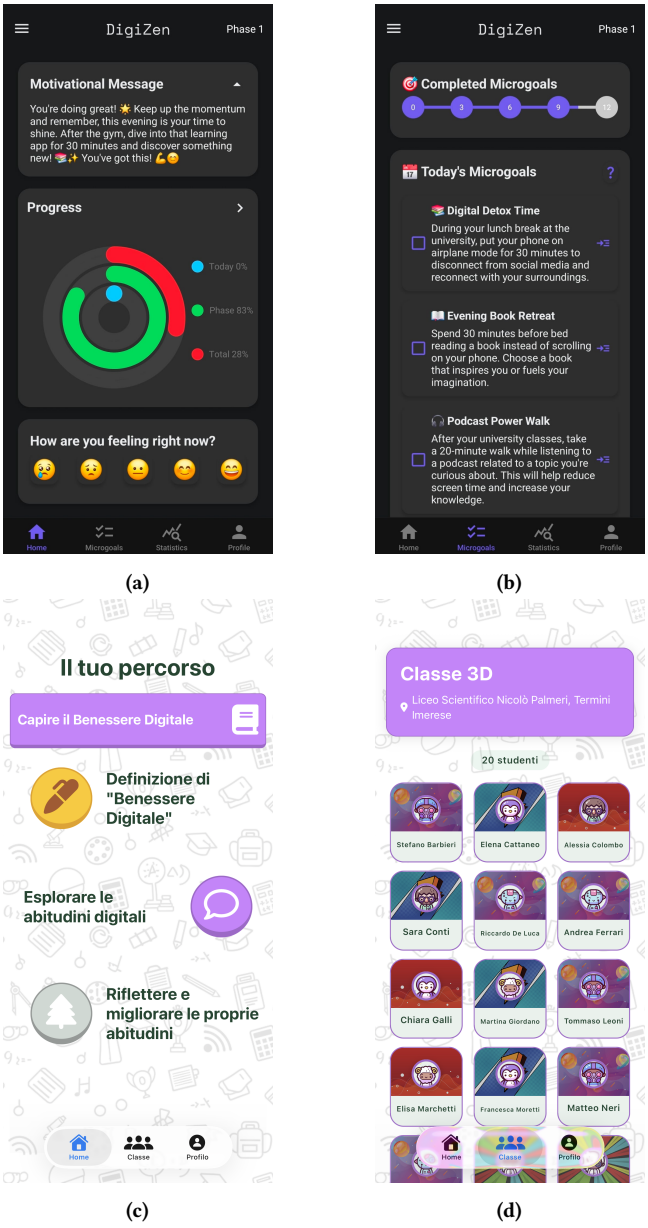


Figure 2: Figures (a) and (b) are screenshots from the DigiZen app, the first one is the home page of the application with a motivational message and the progress status, while the second shows the daily microgoals page. Figures (c) and (d) are from the student mobile application of the DigiTeens system, the former showing the home screen with the educational path activities, the latter is the class view of the same application.

collaboratively, depending on the teacher's choices. In both cases, students are often exposed to aggregated class statistics, which are intended to encourage group reflection. The DigiTeens system has already undergone an initial in-the-lab evaluation with 13 participants. Following the incorporation of design improvements, the system is scheduled for a one-week in-the-wild deployment involving two high school classes, with an expected total of 96 students.

3.3 Brainy

Brainy is based on the idea that visualizing how the brain is affected by daily activities, can stimulate reflection and provoke changes in users. Hence, Brainy becomes a virtual pet with the appearance of a cartoon brain that encourages the user towards positive activities and reflects an approximation of the state of the user's brain with its emotion and colors. This pet needs to be fed with the activities carried out during the day. In Figure 3a we see the moment when the brain receive "food". The user can make it stay well or bad depending on their activities, activities that can be seen on the history section, shown in 3b. The app also offers a digital wellbeing bar and a streak as other gamification elements motivating users to stick to healthier activites. Because of how it works, the app is positioned as totally individual and highly ludic. It have been tested in-the-wild with 17 users during a period of 10 days. These tests has shown promising results, hence the app would benefit from further longer testing.

3.4 Cyberopoli

Cyberopoli is a digital educational board game designed to teach children and adolescents about the negative consequences of digital overuse in an engaging way. Modeled after the popular Monopoly, the game consists of different squares representing various social media platforms, where players can spend internet points aiming at earning more of them from other players. The mechanic of decreasing internet points for all players throughout the game mirrors the attention consumed with excessive technology usage, encouraging reflection on digital habits. The game also features squares with random questions and potential internet-based disadvantages, through which knowledge and awareness about digital wellbeing are passed. Figure 3c shows an example of an ongoing game with two users. To further enhance immersion and curiosity, an AR version of the game is also available. Figure 3d shows the game board projected onto a real desk. This intervention has not yet been evaluated; future plans include conducting multiple sessions with groups of users to assess how players perceive the serious-game approach and the extent to which it promotes awareness and knowledge about digital wellbeing. Cyberopoli is classified as entirely ludic and fully group-based, being a board game to play in groups.

3.5 DigiHide

My latest work focuses on a tool to support teenagers and young adults who struggle to stay focused and avoid smartphone distractions. The DigiHide application, currently under development, uses Virtual Reality with pass-through capabilities to emulate *Diminished Reality*. Specifically, the application is designed to recognize a smartphone placed on a desk and visually remove it from the user's environment, eliminating the source of distraction. This concept is based on evidence that even the mere presence of a smartphone in a study or work environment can reduce focus [21]. The goal of

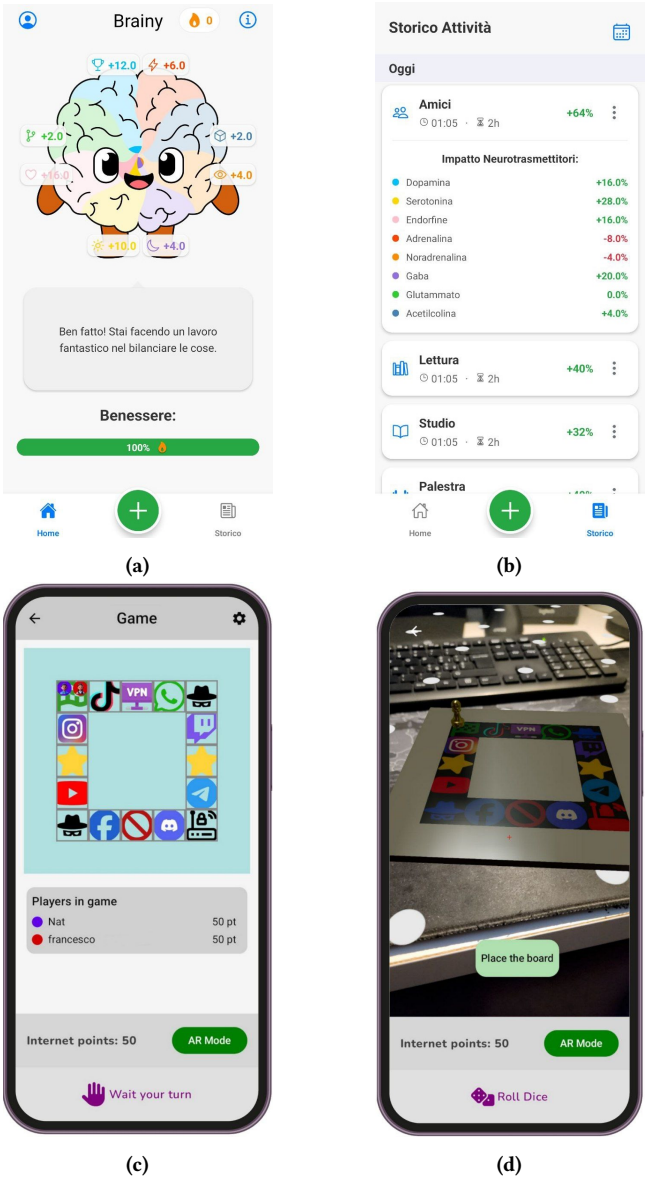


Figure 3: Figures (a) and (b) are screenshots from the Brainy app showing the Home page of the application during an animation involving the virtual pet Brainy (a) and the history page with details of the daily activities (b). The two other figures shows an on-going game in the Cyberopoli app, the first (c) in the standard version while the second (d) in the AR version of it.

this work is to evaluate whether this type of solution is viable, well-received by users, and effective in improving focus and productivity. DigiHide also anticipates a future where Extended Reality technologies could automatically filter smartphone distractions whenever users need to concentrate.

4 Future Works

As illustrated in Figure 1, my future research will continue to explore projects situated within the dimensions established for my current work. These projects vary widely in approach and target. One likely next direction is the design of a social-based application in which groups of users collaborate to encourage one another toward improved digital wellbeing. The goal is to leverage social mechanisms to foster awareness and facilitate habit change, rather than using group-imposed blocks. This intervention, with the temporary name IRLy, would be positioned in the in group dimension with a rather non-ludic orientation, since the main goal is to use sociality as change motivation. In contrast, DigiAdventure is envisioned as a serious storytelling game, similar to a visual novel, where the player makes individual decisions regarding the main character's digital behaviors. These choices influence the main character life, allowing users to observe the consequences of digital habits in a narrative and engaging context. Another potential future direction, with the name SmartParents, targets children and teenagers indirectly by supporting their parents. Many parents may be unaware of the risks of technology use for their children, and an educational tool could raise awareness and equip them to guide their children toward healthier digital habits. This approach would be non-ludic, and it remains to be determined whether the intervention would be structured as individual or group-based.

Taken together, both current and planned projects offer a diverse set of options through which young people of different ages, contexts, and needs can find, or be guided to, the most suitable solutions for improving their digital wellbeing and gaining autonomy and control over technology. This envision a future where young people will find easier maintaining a balance in their technology use.

Acknowledgments

Part of my work was carried out within the "Improving digital wellbeing with and for teens: a gamified and personalized intelligent system" project – funded by the European Union – Next Generation EU, Mission 4 Component 1, within the PRIN 2022 program (CUP E53D23007840006).

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