Introduction to the 14th International Workshop on Behavior Change Support Systems

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Abstract

Behavior Change Support Systems (BCSS) are increasingly popular as a key method for promoting ethical, non-coercive behavior change. This editorial highlights the contributions to the BCSS 2026 International Workshop and outlines emerging and future directions for BCSS research.

Keywords

Behavior Change Support Systems, Persuasive Systems Design

1. Introduction

Technology is advancing rapidly, and it is affecting how people think and act. Building on this, many self-management applications have been developed to ethically change users' behaviors. These apps are called *Behavior Change Support Systems* (BCSS) [1]. They are information systems designed to change or support people's attitudes and behaviors without resorting to coercion or deception [1]. The goal is to change or support attitudes and behaviors, or help people comply with system requests. Persuasive Systems Design (PSD) has been used to create and assess how a BCSS can help users develop a new habit [2]. Various studies have shown that PSD may be effective in changing behavior by utilizing persuasive features that keep users engaged and achieve desired outcomes [3].

Early editions emphasized the need for long-term approaches to persuasion, recognizing that ongoing health issues and lifestyle changes require systems beyond short-term solutions [4]. Recent editions of BCSS proceedings show progress in the field. They move from theoretical concepts to diverse explorations, linking PSD features to psychological theories such as Self-Determination Theory, investigating the costs of persuasive features, and exploring ethical design considerations as well as applications beyond theory [5, 6]. Across all BCSS workshop implementations, there is a progressive use of new technologies, providing a wide toolkit for BCSS designers.

2. 2026 Contributions

The 2026 workshop was held in Hakodate, Japan, as an in-person event. It featured important research papers on BCSS design and use in health and well-being (like physical activity, weight management, mindfulness, and digital therapeutics); education and learning (such as dealing with academic procrastination and learning support through serious games); sustainability and eco-friendly digital use; and BCSS foundations (such as self-control theory, BCSS architecture, and challenges in the field).

2.1. Theory and Impact

The research in the theory and impact section combines ideas from behavioral theory and persuasive design. It explains how BCSS interventions should work and demonstrates the impacts that can be achieved across established application areas.

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In their study, Batuwantudawa et al. [7] introduce the Eco-Impact Tracker, a mobile app BCSS that visualizes the environmental costs of daily digital activities (such as social media use) by estimating CO_2 emissions and battery use from screen-time data. Based on the idea that awareness is key to change, the app provides real-time eco-feedback through an easy-to-use interface. In a controlled study with 20 people, users of the Eco-Impact Tracker were more aware of the environmental impact of their social media habits than those using standard tools. This indicates that targeted feedback can effectively influence attitudes toward more sustainable digital practices, though longer engagement may be necessary to turn awareness into sustained behavior change.

Enkmann [8] reviews evidence from 49 studies on 72 digital BCSS features through the lens of self-control theory [9], framing BCSS as tools that help people align daily actions with long-term goals while resisting temptations and distractions. By comparing interventions based on self-regulatory strategies, the review finds the strongest and most consistent potential in situational strategies that alter the choice environment, whereas cognitive strategies are particularly effective when they encourage specific action planning (e.g., implementation intentions). Training-based methods showed more limited, broad-term effects beyond the specific skills being taught. The paper also offers six design and research suggestions to improve the design and assessment of BCSS across different fields.

BCSS can help boost self-efficacy and support the adoption of more goal-focused behaviors. In their review study, Kemppainen and Oinas-Kukkonen [10] analyze how BCSS are designed to combat academic procrastination by improving self-regulation. They apply the PSD model to organize and interpret previous applications. The review highlights common primary-task support features, such as reduction, tunneling, tailoring, and self-monitoring, which are associated with goal setting. It also mentions advanced techniques, like simulation through reflective writing and metacognitive prompts, and rehearsal through cognitive reframing. Additionally, it shows the potential of rewards and social features, suggesting that peer-supported goal sharing and collaborative reflection could be particularly useful for maintaining change in academic settings.

Iqbal et al. [11] examine how PSD principles integrated into virtual reality (VR) meditation enhance users' cognitive absorption and overall engagement. Using a Design Science approach, the authors create a nature-inspired, culturally informed prototype with key persuasive features. Their mixed-methods evaluation indicates that cognitive absorption is positively associated with perceived usability. The PSD-aligned guidance and feedback features can make the experience more immersive, engaging, and user-friendly. Their research demonstrates how PSD and usability can help develop meaningful VR experiences for wellbeing.

2.2. Frameworks and Architectures

Research in this section highlights the underlying structures that make BCSS more scalable and adaptable. They propose frameworks and system architectures that support the design, development, and consistent evaluation of BCSS across different contexts.

Hayakawa et al. [12] present a persuasive mHealth system that personalizes physical activity interventions by inferring users' psychological traits from in-app interaction logs. The architecture combines automated trait estimation with reinforcement learning to dynamically choose intervention strategies over time. Additionally, the system uses an LLM to create highly personalized messages that accompany those interventions. In a large experiment involving 396 people, the reinforcement learning approach achieved higher physical activity rates than random or static personalization, maintaining an implementation rate of about 50% after six weeks. The study shows that data-driven, questionnaire-free personalization can support sustained engagement in behavior change interventions.

Yamaguchi et al. [13] propose a Universal Modular Intervention (UMI), a framework and architecture intended to close the persistent gap between theoretically sound behavior change interventions. In addition to their implementation by lowering the technical cost of building and iterating BCSS. The author's core idea, "Intervention-as-Code," separates intervention design, implementation, and execution, allowing domain experts to specify interventions and deploy or modify them without rebuilding entire applications. By treating intervention elements as reusable, combinable modules, UMI aims to speed up prototyping, strengthen reproducibility, and support cross-domain reuse, offering a shared foundation for accumulating and sharing BCSS knowledge.

While Large Language Models (LLMs) can personalize dialogue. However, prompt-based "rules" are difficult to enforce reliably, creating risks to safety and therapeutic fidelity. To address this core architectural challenge in LLMs, Devilee et al. [14] propose Protocol-Guided Dialogue, an architecture in which the therapeutic protocol is implemented entirely outside the model. A system-level orchestration layer that manages key components: phases, goals, progression criteria, and decision rules. The LLM then generates responses within these limits. Using Competitive Memory Training as an illustrative example, the paper argues that making the logic of interventions explicit and governable improves accountability and supports responsible clinical deployment of generative systems.

Within the learning and education domain, Oyibo [15] introduces and validates RADAR, a framework for designing mnemonics-based educational serious games that motivate retrieval practice as a pathway to stronger long-term learning. RADAR structures gameplay around four cognitive stages: Recollection, Association, Decoding, and Artifacts Review. Guiding learners from recalling their mnemonics to linking and unpacking them, then reflecting on the resulting learning artifacts. In an experimental study using a biology-content game, the RADAR-based approach outperformed rote memorization, particularly for more difficult topics. The research argues that the framework can be adapted to other memory-intensive subjects and offers practical design principles for future mnemonics-based learning games.

Lastly, Vlahu-Gjorgievska et al. [16] report qualitative findings on what young adults and health professionals believe is needed to sustain engagement with weight-management apps that support healthy eating and physical activity. Through semi-structured interviews, the authors identify three overarching themes: Behavioral Aspects, Health Education, and App Design Features, which are translated into practical design requirements and mapped to PSD principles. The resulting feature priorities emphasize Tailoring and support for self-monitoring, reminders, suggestions, rewards, and liking alongside credibility-oriented elements and social-support features such as social facilitation

2.3. Grand Challenges and Possibilities for Future Research

Iyengar et al. [17] examine how Persuasive Technology (PT) and BCSS research have evolved over time. They point out important challenges, especially with new technologies like virtual/augmented reality and Artificial Intelligence (AI). The authors suggest five areas for future research: achieving long-term sustained behavior change, improving understanding of motivation, defining AI's role, reducing misinformation and disinformation, and strengthening the cognitive-science foundations of PT. The paper stresses that progress requires collaborations across disciplines, rigorous methods, and clear ethical principles.

3. Conclusion

This year's collection of papers shows that the BCSS as a research field is maturing, balancing theoretical foundations, demonstrating impact, and furthering system design. The "*Theory and Impact*" papers illustrate how well-established theories (such as Self-Control Theory, the PSD model, and Cognitive Absorption) can be used in BCSS. They also provide design implications for practice, from eco-awareness to academic self-regulation and immersive wellbeing. The papers included under "*Frameworks and Architectures*" guide the field toward scalable and responsible interventions. They suggest modular intervention infrastructures, data-driven (i.e., questionnaire-free) personalization, and governance layers for LLM-based therapeutic dialogue. Finally, the proceedings present major challenges and future directions for BCSS and PT. Together, these studies suggest using flexible, reusable architectures with transparent and ethical persuasive strategies, while continuing to assess what sustains engagement and behavior change over time.

Declaration on Generative AI

During the preparation of this work, the author(s) used Grammarly to correct grammar and spell check. After reviewing and editing the content as needed, the authors assume full responsibility for the content of the publication.

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