Bridging the Theory-to-Design Gap in Digital Wellness: A Design Science Approach to Motivational and Compassionate System Design

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Digital wellness applications hold promise for lifestyle medicine, yet sustained engagement remains challenging because motivational and compassionate design principles are rarely operationalised as system mechanisms. This theory-to-design gap represents the core problem addressed in this study. Adopting Design Science Research Methodology, we develop MiCARE, a progressive web application supporting nutrition and physical activity engagement among young adults in preventive wellness contexts. Drawing on Self-Determination Theory and the CARE framework, we derive three design requirements, autonomy-supportive personalisation, competence-oriented coaching and feedback, and empathic interaction support and instantiate them as operational features. MiCARE was iteratively co-designed with young adults and clinicians. A formative usability evaluation (n=8) demonstrates strong usability (SUS=82.5), high task completion (97.5%), and high perceived empathy (92.5/100), providing preliminary evidence of the enactment of the design mechanisms. The study contributes a transparent DR–DP–DF translation approach and an empirically informed prototype demonstrating initial feasibility within a preventive, non-clinical wellness context.

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1 Introduction

As defined by the American College of Lifestyle Medicine, lifestyle medicine prevents and manages chronic disease through six pillars: nutrition, physical activity, sleep, stress management, social connection, and substance avoidance (ACLM, 2026; Lippman et al. 2024). Nutrition and physical activity are central to prevention, for example, demonstrating reductions in type 2 diabetes incidence among individuals with prediabetes (Demissie et al. 2025). Unlike pharmacological approaches that primarily manage symptoms, lifestyle-oriented approaches emphasise supporting awareness of healthier lifestyles and engagement with wellness practices (Bodai et al. 2018).

Digital wellness technologies offer a promising channel for delivering such interventions at scale (Hazra-Ganju et al. 2023). However, sustained engagement remains a persistent challenge (Eiselt et al. 2025). Many applications successfully support initial uptake but struggle to retain users over time, limiting their long-term preventive value (Szinay et al. 2020). Evidence suggests this is not merely a technical failure but a design failure (Tzimourta 2025). Many systems privilege monitoring and tracking while offering insufficient motivational support, limited empathetic interactions, and limited user assistance (Dostert and Müller 2021).

Despite frequent citation of motivational and behavioural theories in digital health research, there is a persistent failure to operationalise them within artefact design (Heinsch et al. 2021; Zhang et al. 2021). Digital wellness systems rarely integrate both motivational support and compassionate forms of interaction in ways that are visible in system functionality (van Lotringen et al. 2023). This constitutes a theory-to-design gap: a critical middle layer between conceptual frameworks and their translation into concrete, testable system mechanisms. We therefore ask: How can motivational and compassionate care principles be translated into operational system mechanisms within digital wellness applications? We address this question through Design Science Research Methodology (DSRM) and develop MiCARE, a progressive web application prototype supporting nutrition- and physical activity-related wellness engagement among young adults in preventive contexts. Drawing on Self-Determination Theory (SDT) (Ryan and Deci 2000) and the CARE framework (Compassion, Assistance, Respect, and Empathy) (Sinclair et al. 2017, 2018), we derive design requirements (DR), translate them into design principles

(DP) and design features (DF), and instantiate and evaluate them in a functioning prototype. This study makes two primary contributions. First, it advances design science knowledge by providing a transparent and reproducible DR–DP–DF translation approach that links motivational and compassionate theory to concrete system mechanisms. Second, it demonstrates the feasibility of this approach through the MiCARE prototype and formative usability evaluation, providing preliminary evidence of usability and perceived effectiveness.

2 Related Work and Theoretical Foundations

2.1 Digital Wellness Engagement as a Design Challenge

The effectiveness of digital wellness interventions depends not only on access or functionality, but on users' willingness to remain engaged over time (Thanthrige and Wickramasinghe 2025). Existing evidence shows that disengagement remains a major challenge in app-based health interventions, particularly when systems rely on self-monitoring and routine data entry without adequately supporting users' motivation, context, or lived experience (Bailey-Davis et al. 2021; Lim et al. 2022).

Prior studies indicate that declining engagement is shaped by repetitive interaction patterns, low personal relevance, insufficient personalisation, and limited emotional support during setbacks or lapses (LeSeure et al. 2024; Oh et al. 2021). For example, culturally tailored features such as Portuguese-specific carbohydrate tracking and simplified no-login interfaces may improve relevance and usability, yet apps can remain limited by incomplete feedback, restricted language support, or weak real-time interaction (LeSeure et al. 2024; Xue et al. 2025). Similarly, chatbot-based interventions have shown promise when they incorporate personalised goal setting, relational strategies, or conversational support, but engagement reporting and sustained use remain inconsistent across studies (Nadarzynski et al. 2024; Oh et al. 2021; Wu et al. 2024; Zhang et al. 2020). Prospective evidence further confirms that meaningful feature engagement not mere app access is associated with better health outcomes (Lim et al. 2022), underscoring that the design of system mechanisms, not just their presence, is what matters. From an IS perspective, this is a design challenge. The key question is how to embed motivational, supportive, and context-sensitive mechanisms into system functionality rather than treating them as abstract aspirations. Within IS, design science research has been increasingly applied to address such challenges. It does so by developing theory-grounded artefacts that embed motivational and relational mechanisms into system functionality to support sustained user engagement (Hevner et al. 2004; Baskerville et al. 2018).

2.2 Theoretical Foundations: SDT and CARE Framework

This study draws on two complementary theoretical sources selected because they directly address the two recurrent design deficiencies identified above: insufficient motivational support and limited relational sensitivity. SDT explains sustained motivation through the fulfilment of three basic psychological needs: autonomy, competence, and relatedness (Ryan and Deci 2000). Autonomy concerns a sense of volition and choice; competence reflects feelings of effectiveness and progress; and relatedness refers to feeling supported and understood (Martela and Riekki 2018). These constructs are highly relevant to digital wellness contexts, where users must often sustain effort without direct human supervision (Amirabdolahian et al. 2025). While SDT identifies autonomy, competence, and relatedness as distinct needs, this study operationalises relatedness through the CARE framework rather than as a standalone design requirement. This decision reflects a deliberate theoretical choice: in a non-clinical digital wellness context, relatedness is primarily experienced through the quality of interaction rather than as a structural system property. The CARE framework, comprising compassion, assistance, respect, and empathy, highlights the communicative behaviours through which a system can fulfil the relatedness need, making it the more actionable operationalisation for artefact design. CARE captures how relatedness is experienced in interaction through empathy, compassion, and respect thereby translating relational constructs into actionable design mechanisms.

Complementing SDT, the CARE framework comprising compassion, assistance, respect, and empathy highlights the importance of compassionate, respectful, and responsive interaction in healthcare settings (Sinclair et al. 2017; Sinclair et al. 2018). The CARE framework is particularly relevant for digital health systems because it operationalises compassionate communication behaviours that can be embedded in conversational interfaces. SDT and CARE are theoretically complementary rather than competing: SDT explains the motivational conditions required for sustained engagement, while CARE specifies the relational quality through which those conditions can be communicated in system interactions. Within IS research, empathic and trust-building interaction has been identified as a critical antecedent of user acceptance and continued engagement in conversational agent systems (Ayers et al. 2023; Oh et al. 2021), positioning CARE as directly applicable to IS artefact design. Together, they provide a comprehensive basis for designing wellness systems that support user experience.

2.3 Translating Theory into Digital Wellness Artefacts

Although motivational and CARE concepts are widely recognised in health and behavioural research, their translation into digital wellness artefacts remains limited (Anser et al. 2025). Existing applications often reference behaviour change concepts at a high level but provide little transparency regarding how such concepts influence functional design decisions (Del-Valle-Soto et al. 2024). This limitation reflects a persistent theory-to-design gap, a critical middle layer problem in digital health systems (Persson and Rydenfält 2021). For design science research, this gap is especially important because the value of an artefact lies not only in whether it works, but also in how its design can be justified and communicated (Wiegmann et al. 2023). A structured approach is therefore required to connect theoretical constructs with DR, DP, and DF. In this study, SDT and CARE are treated as design knowledge sources and translated into a systematic DR–DP–DF structure guiding the development of MiCARE. Figure 1 illustrates the theory-driven design logic used in this study, linking lifestyle medicine pillars with the theoretical foundations, DRs, and implemented system features that lead to expected user outcomes.

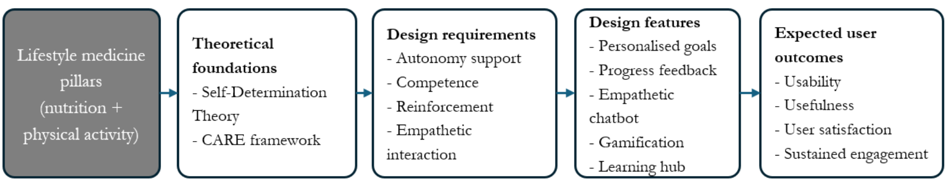

Figure 1: Theory-Driven Framework for Motivational Digital Wellness Design
Source: Own

In addition, prior research highlights that sustained engagement is strongly influenced by perceived outcomes (e.g., improved energy, wellbeing, or lifestyle confidence) and by the need for continued novelty and value in interactions. While outcome measurement is beyond the scope of the present formative study, the proposed framework is intentionally extensible to incorporate outcome-visibility and adaptive engagement mechanisms in future iterations.

Importantly, many digital health interventions are vulnerable to the “eHealth law of attrition” (Eysenbach, 2005), in which a large proportion of users discontinue engagement over time despite promising initial uptake. While a pleasant interface and positive short-term user experience help mitigate early dropout, sustained use requires ongoing perceived value and newness in each interaction elements that go beyond the three core requirements addressed in this study.

3 Methodology

This study adopts DSRM to address the research question (Hevner et al. 2004; Peffers et al. 2008). DSRM is appropriate because the study seeks not merely to understand an engagement problem but to design, develop, and evaluate a novel artefact that addresses it an aim that aligns directly with DSRM’s dual goals of problem-solving utility and design knowledge contribution (Baskerville et al. 2018). The research process followed five established DSRM stages: problem identification, definition of solution objectives, artefact design and development, evaluation, and communication of research contributions, illustrated in Figure 2. Ethics approval was obtained from the La Trobe University Human Research Ethics Committee (Project No. HEC24507).

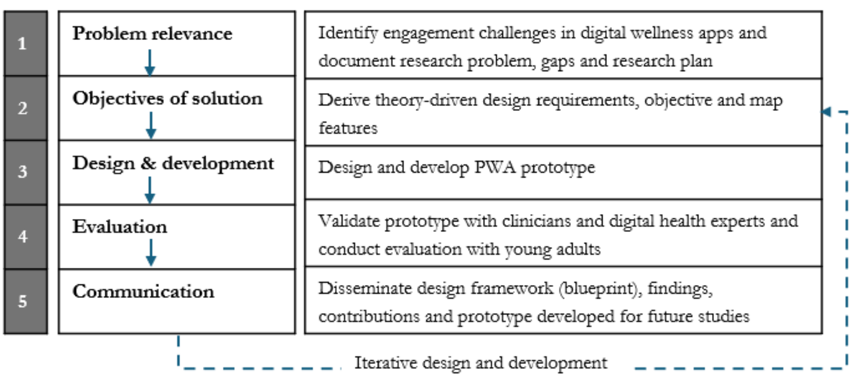

Figure 2: DSRM Research Process for MiCARE
Source: Own

In addition to the DSRM logic, the study adopted co-design sessions during requirements exploration and prototype refinement, ensuring theoretical insights were grounded in empirically collected stakeholder perspectives rather than translated into design decisions in isolation (Vargas et al. 2025). Two stakeholder groups informed the design across iterative rounds. Six domain experts consisting of a senior clinician, a digital health academic, a computer science academic, and three research fellows provided structured feedback on educational content accuracy, chatbot response tone, cultural alignment, gamification strategies, and the boundary between supportive wellness guidance and inappropriate clinical advice. Twenty young adults aged 18–34 participated in co-design sessions, contributing UI preferences, navigation patterns, interaction style expectations, and motivational support needs through structured surveys assessing clarity, cognitive load, personalisation, and perceived usefulness. Survey responses and expert feedback were thematically coded against the SDT constructs of autonomy, competence, and relatedness, as well as the CARE dimensions, to identify convergent design priorities. Codes were then grouped into emergent design themes, which directly informed the derivation of the three DRs. Together, these 26 stakeholders grounded the DR–DP–DF structure in both clinical rigour and user-centred evidence prior to prototype development. Also, no clinical or sensitive health data were collected, in line with ethics approval (HEC24507).

4 Objectives of Solution and DRs (DSRM Phase II)

Having established the theory-to-design gap as the core problem, DSRM Phase II defines the solution objective and derives DRs. The objective is to develop a digital wellness artefact that operationalises motivational and compassionate principles to support engagement with wellness information and lifestyle-related digital content.

SDT and the CARE framework inform three DRs. SDT posits that sustained engagement depends on meeting the psychological needs of autonomy, competence, and relatedness (Ryan and Deci 2000); CARE posits that the manner of interaction compassionate, respectful, empathetic shapes how those needs are perceived as met (Sinclair et al. 2018). Applying these jointly in a digital system requires embedding both motivational scaffolding and relational communication tone into artefact mechanisms. Three DRs follow: autonomy-supportive personalisation (DR1), competence-oriented coaching and feedback (DR2), and empathic interaction support (DR3).

Autonomy-supportive personalisation (DR1): This requirement addresses SDT's emphasis on autonomy. Digital wellness systems should support user-defined goals rather than imposing prescriptive recommendations (Babu and Joseph 2025). Evidence indicates that digital wellness programs allowing user choice can strengthen participation and perceived engagement, particularly in diabetes and prediabetes management (Bailey-Davis et al., 2021; LeSeure et al., 2024; Lim et al., 2022). Consequently, the corresponding DP prioritises personalised goal setting and culturally tailored options, which have been shown to enhance engagement in digital health tools (LeSeure et al., 2024; Oh et al., 2021). MiCARE operationalises this through customisable nutrition and physical activity goals with adjustable targets. By providing flexibility and user choice, the system aims to reinforce intrinsic motivation and reduce perceived external pressure (Li et al. 2025b).

Competence-oriented coaching and feedback (DR2): Research shows that competence is strengthened not only through feedback but through guided capability development helping users understand what to do, why it matters, and how to improve over time. While progress indicators and gamification support motivation, they are insufficient alone. Therefore, the corresponding DP includes structured guidance, micro-coaching, and actionable behavioural support, in addition to visual feedback. MiCARE operationalises this through progress dashboards, gamified elements, and embedded educational guidance delivered via the learning hub and chatbot, focused on general wellness information rather than clinical advice.

Empathic interaction support (DR3): This requirement focuses on fostering empathetic, relational communication. Empathy is operationalised through supportive tone, non-judgmental language, and context-sensitive responses, informed by the CARE framework. Importantly, clinician review contributes to content reliability and safety rather than empathy itself. MiCARE achieves this through a bounded, clinician-reviewed conversational chatbot providing general wellness guidance and supportive interaction, without offering clinical diagnosis or treatment, ensuring alignment with ethical constraints.

Table 1: DRs Derived from Theoretical Foundations

Design Requirement	Theoretical Basis	Design Principle	System Feature
Autonomy support (DR1)	SDT	Enable users to define personal wellness goals (DP1)	Personalised goal setting (DF1)
Competence-oriented coaching and feedback (DR2)	SDT	Provide feedback and structured guidance (DP2)	Progress dashboard, activity tracking, gamification elements and embedded educational guidance (DF2)
Empathic interaction support (DR3)	CARE Framework	Support empathic communication (DP3)	Clinician-reviewed conversational chatbot and evidence-based learning hub (DF3)

In addition to these functional requirements, the artefact was developed with consideration of several non-functional aspects, including usability, accessibility, privacy, and practical deployment within digital wellness contexts. Table 2 outlines the key functional features implemented in the MiCARE prototype and their intended outcomes.

Table 2: Key Functional Features of the MiCARE System

Feature	Description	Intended Outcome
Personalised goal setting (DF1)	Allows users to define personalised nutrition and physical activity goals aligned with their preferences and lifestyle context.	Support user autonomy
Progress dashboard, activity tracking, gamification elements (DF2)	Includes a progress dashboard, activity tracking, and gamified elements that provide visual feedback on progress within the application interface and milestone achievements.	Reinforce competence through feedback and structured guidance
Clinician-reviewed conversational chatbot and evidence-based learning hub (DF3)	Clinically verified conversational chatbot and evidence-based learning hub (e.g. based on Australian Dietary Guidelines, Australia's Physical Activity and Sedentary Behaviour Guidelines, National Health and Medical Research Council (NHMRC), Guidelines and Diabetes Australia) providing supportive messages, guidance, and evidence-based wellness information.	Provide empathic support and encourage continued engagement

Together, the three DRs, DPs, and DFs form a structured DR–DP–DF framework that clearly links theory to system design the core design knowledge contribution of this study.

5 Design and Development of the Prototype (DSRM Phase III)

Following derivation of DRs, DSRM Phase III involved design and development of the MiCARE prototype as a browser-based progressive web application. The architecture comprises four primary layers presentation, application, logic, and data storage structured to support modular development while ensuring each layer directly instantiates one or more of the three DRs.The presentation layer provides a user interface designed for clarity, accessibility, and ease of use, informed by Web Content Accessibility Guidelines (WCAG) guidelines. Visual dashboards present activity progress and evidence-based educational content in an intuitive format. The application layer contains the primary interaction modules operationalising the DRs: goal personalisation (DF1), progress tracking and gamification (DF2), conversational support (DF3), configurable reminders, and educational content delivery. The reminder function was designed to be user-configurable rather than prescriptive, reinforcing autonomy rather than compliance (DR1). The logic layer processes user activity data, manages dynamic system responses, and bounds the chatbot to preventive wellness education. Clinician-reviewed response intents and escalation wording were applied to ensure responsible design preventing inappropriate clinical guidance. Empathic interaction was technically operationalised through clinician-reviewed Dialogflow ES intents with a 0.3 confidence threshold triggering fallback responses, and escalation wording designed to prevent clinical overreach while maintaining a supportive conversational tone. The data layer stores user profiles, activity records, and interaction logs supporting both system functionality and evaluation. The novelty of MiCARE lies not in any individual feature but in the systematic, coherent integration of motivational, empathic, and responsible design mechanisms across the full system architecture demonstrating how the theory-to-design gap can be bridged in practice.

6 Evaluation of Prototype (DSRM Phase IV)

In line with DSRM, we conducted a formative usability evaluation to assess whether the three design mechanisms autonomy support, competence-oriented coaching and feedback, and empathic interaction were usably enacted in the MiCARE prototype (Hevner et al. 2004). Formative evaluation at this stage is consistent with DSRM, which emphasises iterative assessment of artefact utility prior to large-scale deployment (Peffers et al. 2008). The evaluation assessed three dimensions standard in interactive health system assessment: effectiveness (task completion and error rates), efficiency (task duration, clicks, and chatbot utterances), and satisfaction (System Usability Scale (SUS) score and perceived empathy) (Nielsen and Landauer, 1993). Eight young adults aged 18–34 years (mean age 26.9, SD=4.2; 50% female) were recruited using purposive sampling to ensure diversity across cultural background, gender, and geographic location within Victoria, Australia. Purposive sampling is appropriate for formative usability evaluation where the aim is to identify interface issues rather than achieve statistical representativeness (Nielsen and Landauer, 1993). Eligible participants owned a smartphone or computer and expressed interest in improving diet or physical activity habits. Individuals with diagnosed diabetes or requiring clinical dietary advice were excluded to maintain alignment with the preventive wellness scope of the system and approved ethical guidelines. Eight participants are consistent with established usability research demonstrating that this sample size identifies the majority of interface issues in early-stage evaluation (Nielsen and Landauer, 1993).

Testing was conducted remotely via one-on-one video conferencing sessions to ensure accessibility across metropolitan and regional Victoria. Each session followed a four-component structured protocol: (1) a background questionnaire capturing demographics and prior wellness app experience; (2) ten representative task-based interactions, whereby participants provide thoughts and expectations (3) the SUS questionnaire; and (4) a brief semi-structured interview. Sessions lasted 60–75 minutes and were audio-recorded with participant consent. The lead researcher facilitated all sessions using a standardised guide to ensure consistency. Chatbot non-recognition events were defined as user utterances not matched to any predefined conversational intent, triggering a fallback response. The SUS is a validated 10-item instrument widely used in digital health usability research, with scores above 80 classified as excellent (Bangor et al. 2008). Perceived empathy was assessed using a 0–100 scale, consistent with prior conversational agent research (Ayers et al. 2023).

Quantitative data, task completion rates, error counts, SUS scores, chatbot utterance counts, and empathy ratings were summarised using descriptive statistics (means, standard deviations, counts, and percentages). Qualitative data from task based interactions and semi-structured interviews were analysed using thematic analysis (Braun and Clarke 2006), in which codes were iteratively developed and organised into themes and subthemes through repeated engagement with the data.

Triangulation across quantitative performance metrics and qualitative findings supported a comprehensive and internally consistent interpretation of user experience (Creswell and Plano Clark 2018). Findings are reported according to the three design mechanisms to maintain direct traceability to the DR–DP–DF framework.

Autonomy support (DR1/DF1) was positively reflected in qualitative feedback and interaction patterns. Participants valued goal configurability and described the interaction as flexible due to quick-access options and self-paced navigation. Two minor navigation slips occurred when switching between modules, suggesting the need for clearer first-use guidance and a persistent navigation menu identified as a targeted refinement for the next iteration. Competence reinforcement (DR2/DF2) was evidenced by efficient task performance and usability ratings. Participants successfully completed 78 of 80 tasks (97.5%) without facilitator intervention. MiCARE achieved a mean SUS score of 82.5 (SD=11.3), classified as excellent usability. Participants highlighted the visibility of progress indicators and interface simplicity as supporting confidence and competence during task completion. Empathic interaction (DR3/DF3) was strongly endorsed. Across 105 chatbot utterances, 10 (9.5%) triggered recoverable fallback prompts, consistent with the bounded, rule-based design of the conversational system. Perceived empathy was high (mean 92.5/100), with participants frequently describing the chatbot as 'supportive' and 'non-judgmental'. Participants suggested that fallback prompts could provide clearer contextual guidance when queries were ambiguous with targeted improvement for subsequent iterations. Overall, the evaluation indicates that all three design mechanisms were positively perceived: the DR–DP–DF instantiation showed promising results across effectiveness, efficiency, and satisfaction dimensions. These results provide preliminary, formative evidence that the DR–DP–DF mechanisms are usable and meaningfully perceived by users, but do not establish long-term engagement, behavioural change, or clinical outcomes.

7 Discussion

This study examined how motivational and compassionate principles can be operationalised in digital wellness systems. The central contribution is a structured DR–DP–DF framework that bridges the theory-to-design gap identified in prior digital health research: three theoretical constructs (SDT autonomy, SDT competence, and CARE empathy as operationalisation of SDT relatedness) were systematically translated into three DRs, three DPs, and three implemented features, each evaluated formatively. Findings confirm that the mechanisms were positively perceived across all three dimensions. The evaluation results indicate that the instantiated design mechanisms derived through the DR–DP–DF structure were usably enacted in the prototype, suggesting that the framework provides a workable mechanism for translating theoretical constructs into operational system design.

The contributions of this study are twofold. Theoretical contribution: Although motivational and behavioural theories are frequently referenced in digital health research, prior studies rarely demonstrate how such theories are translated into concrete artefact design (Heinsch et al. 2021). By operationalising SDT and the CARE framework through a structured DR–DP–DF model, this study provides a transparent mechanism for translating theoretical constructs into implementable system functionality. The DR–DP–DF structure itself comprises design knowledge that extends the IS design science literature: it offers an explicit, auditable middle layer that prior digital health artefacts lack. The integration of SDT and CARE is theoretically novel: SDT addresses motivational conditions while CARE addresses the relational quality of interactions, and their combined operationalisation has not previously been demonstrated in a functioning artefact. Practical contribution: The MiCARE prototype demonstrates how digital wellness platforms can move beyond simple monitoring and tracking toward supportive, engaging, and human-centred experiences. The DR–DP–DF framework provides a transferable design template for developers and healthcare organisations building responsible digital wellness interventions. The clinician-reviewed, bounded chatbot design offers a practical model for responsible conversational design that avoids inappropriate clinical advice.

This study has three limitations. First, the evaluation was limited to short-term formative usability testing rather than long-term real-world deployment. Second, the usability evaluation sample was small and drawn from a single geographic region, limiting generalisability to broader populations and cultural contexts. Third, the rule-based chatbot faced constraints common in bounded conversational systems when responding to ambiguous inputs. Importantly, sustained engagement remains an open challenge. Prior research highlights the "eHealth law of attrition" (Eysenbach, 2005), where user engagement declines over time despite initial usability. While

MiCARE demonstrates strong initial interaction quality, long-term adoption will depend on continued novelty, contextual relevance, and perceived value. Future work will incorporate adaptive and outcome-oriented features within appropriate ethical approvals. Future work may also explore structured requirement–feature mapping approaches such as Quality Function Deployment (QFD) to expand the DR–DP–DF framework while maintaining traceability between requirements and system features.

8 Conclusion

This study demonstrates how motivational and compassionate design principles can be translated into operational system mechanisms, addressing the theory-to-design gap in digital health. Using DSRM, MiCARE operationalises SDT and the CARE framework into an explicit DR–DP–DF structure. Formative evaluation provides preliminary evidence that autonomy support, competence-oriented coaching, and empathic interaction were positively perceived by users. Findings remain early-stage and usability-focused; long-term engagement and behavioural outcomes require further validation. The study contributes a design-oriented framework and an initial artefact demonstrating feasibility within a preventive, non-clinical wellness context.

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End notes

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References

Amirabdolahian, S., Pare, G., and Tams, S. 2025. "Digital Wellness Programs in the Workplace: Meta-Review," *J Med Internet Res* (27), p. e70982.

Anser, M. K., Nabi, A. A., Ahmad, I., Abro, M. M. Q., and Zaman, K. 2025. "Advancing Mental Health Care: A Comprehensive Review of Digital Tools and Technologies for Enhancing Diagnosis, Treatment, and Wellness," *Health Care Sci* (4:3), pp. 163-178.

Ayers, J. W., Poliak, A., Dredze, M., Leas, E. C., Zhu, Z., Kelley, J. B., Faix, D. J., Goodman, A. M., Longhurst, C. A., Hogarth, M., and Smith, D. M. 2023. "Comparing Physician and Artificial Intelligence Chatbot Responses to Patient Questions Posted to a Public Social Media Forum," *JAMA internal medicine* (183:6), pp. 589-596.

Babu, A., and Joseph, A. P. 2025. "Digital Wellness or Digital Dependency? A Critical Examination of Mental Health Apps and Their Implications," *Front Psychiatry* (16), p. 1581779.

Bailey-Davis, L., Wood, G. C., Cook, A., Cunningham, K., Jamieson, S., Mowery, J., Naylor, A., Rolston, D. D., Seiler, C., and Still, C. D. 2021. "Communicating Personalized Risk of Diabetes and Offering Weight Reduction Program Choice: Recruitment, Participation, and Outcomes," *Patient education and counseling* (104:5), pp. 1193-1199.

Bangor, A., Kortum, P. T., and Miller, J. T. 2008. "An Empirical Evaluation of the System Usability Scale," International Journal of Human-Computer Interaction (24:6), pp. 574–594.

Baskerville, R., Baiyere, A., Gregor, S., Hevner, A., and Rossi, M. 2018. "Design Science Research Contributions: Finding a Balance between Artifact and Theory," Journal of the Association for Information Systems (19:5), pp. 358–376.

Braun, V., and Clarke, V. 2006. "Using Thematic Analysis in Psychology," Qualitative Research in Psychology (3:2), pp. 77–101.

Bodai, B. I., Nakata, T. E., Wong, W. T., Clark, D. R., Lawenda, S., Tsou, C., Liu, R., Shiue, L., Cooper, N., Rehbein, M., Ha, B. P., McKeirnan, A., Misquitta, R., Vij, P., Klonecke, A., Mejia, C. S., Dionysian, E., Hashmi, S., Greger, M., Stoll, S., and Campbell, T. M. 2018. "Lifestyle Medicine: A Brief Review of Its Dramatic Impact on Health and Survival," *Perm J* (22), pp. 17-025.

Castro, V. d., Martín-Peña, M. L., Martínez, E. M., and Salgado, M. 2025. "Combining Action Research with Design Science as a Qualitative Research Methodology. An Application to Service (Operations) Management Research," *International Journal of Qualitative Methods* (24), p. 16094069241312018.

Creswell, J. W., and Plano Clark, V. L. 2018. Designing and Conducting Mixed Methods Research (3rd ed.). Thousand Oaks, CA: Sage.

Del-Valle-Soto, C., López-Pimentel, J. C., Vázquez-Castillo, J., Nolazco-Flores, J. A., Velázquez, R., Varela-Aldás, J., and Visconti, P. 2024. "A Comprehensive Review of Behavior Change Techniques in Wearables and Iot: Implications for Health and Well-Being," *Sensors (Basel)* (24:8).

Demissie, G. D., Birungi, J., Shrestha, A., Haregu, T., Thirunavukkarasu, S., and Oldenburg, B. 2025. "The Effectiveness of Lifestyle Interventions in Reducing Cardiovascular Risk and Risk Factors in People with Prediabetes: A Systematic Review and Meta-Analysis," *Nutrition, Metabolism and Cardiovascular Diseases* (35:10), p. 104130.

Dostert, J., and Müller, R. 2021. "Motivational Assistance System Design for Industrial Production: From Motivation Theories to Design Strategies," *Cognition, Technology & Work* (23:3), pp. 507-535.

Eiselt, A. K., Kirkendall, S., Xiong, E., Langner, D., and Goldfarb, M. 2025. "Achieving Clinically Meaningful Outcomes in Digital Health: A Six-Step, Cyclical Precision Engagement Framework (Engage)," *Front Digit Health* (7), p. 1713334.

Eysenbach, G. (2005). The law of attrition. Journal of Medical Internet Research, 7(1), e11. https://doi.org/10.2196/jmir.7.1.e11

Gregor, S., and Zwikael, O. 2024. "Design Science Research and the Co-Creation of Project Management Knowledge," *International Journal of Project Management* (42:3), p. 102584.

Hazra-Ganju, A., Dlima, S. D., Menezes, S. R., Ganju, A., and Mer, A. 2023. "An Omni-Channel, Outcomes-Focused Approach to Scale Digital Health Interventions in Resource-Limited Populations: A Case Study," *Front Digit Health* (5), p. 1007687.

Heinsch, M., Wyllie, J., Carlson, J., Wells, H., Tickner, C., and Kay-Lambkin, F. 2021. "Theories Informing Ehealth Implementation: Systematic Review and Typology Classification," *J Med Internet Res* (23:5), p. e18500.

Hevner, A. R., March, S. T., Park, J., and Ram, S. 2004. "Design Science in Information Systems Research," *MIS quarterly* (28:1), pp. 75-105.

Hussain, W., and Grundy, J. 2025. "Advice for Diabetes Self-Management by Chatgpt Models: Challenges and Recommendations,").

LeSeure, P., Chin, E., and Zhang, S. 2024. "A Culturally Sensitive Mobile App (Diafriend) to Improve Self-Care in Patients with Type 2 Diabetes: Development Study," *JMIR diabetes* (9), p. e63393.

Li, M., Liu, S., Yu, B., Li, N., Lyu, A., Yang, H., He, H., Zhang, N., Ma, J., Sun, M., Du, H., and Gao, R. 2025a. "Assessing the Effectiveness of Digital Health Behavior Strategies on Type 2 Diabetes Management: Systematic Review and Network Meta-Analysis," *J Med Internet Res* (27), p. e63209.

Li, X., Pei, X., and Zhao, J. 2025b. "Intrinsic Motivation and Self-Efficacy as Pathways to Innovative Teaching: A Mixed-Methods Study of Faculty in Chinese Higher Education," *BMC Psychol* (13:1), p. 859.

Lim, S. L., Tay, M. H. J., Ong, K. W., Johal, J., Yap, Q. V., Chan, Y. H., Yeo, G. K. N., Khoo, C. M., and Yaxley, A. 2022. "Association between Mobile Health App Engagement and Weight Loss and Glycemic Control in Adults with Type 2 Diabetes and Prediabetes (D'lite Study): Prospective Cohort Study," *JMIR diabetes* (7:3), p. e35039.

Lippman, D., Stump, M., Veazey, E., Guimarães, S. T., Rosenfeld, R., Kelly, J. H., Ornish, D., and Katz, D. L. 2024. "Foundations of Lifestyle Medicine and Its Evolution," *Mayo Clin Proc Innov Qual Outcomes* (8:1), pp. 97-111.

Martela, F., and Riekki, T. J. J. 2018. "Autonomy, Competence, Relatedness, and Beneficence: A Multicultural Comparison of the Four Pathways to Meaningful Work," *Front Psychol* (9), p. 1157.

Nadarzynski, T., Knights, N., Husbands, D., Graham, C. A., Llewellyn, C. D., Buchanan, T., Montgomery, I., Ridge, D., and Silva, J. N. A. 2024. "Achieving Health Equity through Conversational Ai: A Roadmap for Design and Implementation of Inclusive Chatbots in Healthcare," PLOS digital health (3:5), p. e0000492.

Nielsen, J., & Landauer, T. K. (1993). A mathematical model of the finding of usability problems. In Proceedings of the INTERACT '93 and CHI '93 Conference on Human Factors in Computing Systems (pp. 206–213). New York: ACM. https://doi.org/10.1145/169059.169166

Oh, Y. J., Zhang, J., Fang, M.-L., and Fukuoka, Y. 2021. "A Systematic Review of Artificial Intelligence Chatbots for Promoting Physical Activity, Healthy Diet, and Weight Loss," The international journal of behavioral nutrition and physical activity (18:1), pp. 160-160.

Peffers, K., Tuunanen, T., Rothenberger, M. A., and Chatterjee, S. 2008. "A Design Science Research Methodology for Information Systems Research," *Journal of management information systems* (24:3), p. 45.

Persson, J., and Rydenfält, C. 2021. "Why Are Digital Health Care Systems Still Poorly Designed, and Why Is Health Care Practice Not Asking for More? Three Paths toward a Sustainable Digital Work Environment," *J Med Internet Res* (23:6), p. e26694.

Ryan, R. M., and Deci, E. L. 2000. "Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being," *The American psychologist* (55:1), pp. 68-78.

Sinclair, S., Beamer, K., Hack, T. F., McClement, S., Raffin Bouchal, S., Chochinov, H. M., and Hagen, N. A. 2017. "Sympathy, Empathy, and Compassion: A Grounded Theory Study of Palliative Care Patients' Understandings, Experiences, and Preferences," *Palliative medicine* (31:5), pp. 437-447.

Sinclair, S., Hack, T. F., Raffin-Bouchal, S., McClement, S., Stajduhar, K., Singh, P., Hagen, N. A., Sinnarajah, A., and Chochinov, H. M. 2018. "What Are Healthcare Providers' Understandings and Experiences of Compassion? The Healthcare Compassion Model: A Grounded Theory Study of Healthcare Providers in Canada," *BMJ open* (8:3), pp. e019701-e019701.

Szinay, D., Jones, A., Chadborn, T., Brown, J., and Naughton, F. 2020. "Influences on the Uptake of and Engagement with Health and Well-Being Smartphone Apps: Systematic Review," *J Med Internet Res* (22:5), p. e17572.

Thanthrige A, Wickramasinghe N. Digital Health Solutions for Type 2 Diabetes and Prediabetes: Systematic Review of Engagement Barriers, Facilitators, and Outcomes. JMIR Diabetes. 2026 Mar 12;11:e80582. doi: 10.2196/80582. PMID: 41818488; PMCID: PMC12981377.

Tzimourta, K. D. 2025. "Human-Centered Design and Development in Digital Health: Approaches, Challenges, and Emerging Trends," *Cureus* (17:6), p. e85897.

van Lotringen, C., Lusi, B., Westerhof, G. J., Ludden, G. D. S., Kip, H., Kelders, S. M., and Noordzij, M. L. 2023. "The Role of Compassionate Technology in Blended and Digital Mental Health Interventions: Systematic Scoping Review," *JMIR Ment Health* (10), p. e42403.

Vargas, C., Zorbas, C., Longworth, G. R., Ugalde, A., Needham, C., Sunil, A., Venegas Hargous, C., Bennett, R., Forrester-Bowling, T., Cardoso Richter, A. P., and Allender, S. 2025. "Exploring Co-Design: A Systematic Review of Concepts, Processes, Models, and Frameworks Used in Public Health Research," *J Public Health (Oxf)* (47:4), pp. e616-e639.

Wiegmann, P. M., Talmar, M., and de Nijs, S. B. 2023. "Forging a Sharper Blade: A Design Science Research Approach for Transition Studies," *Environmental Innovation and Societal Transitions* (48), p. 100760.

Wu, Y., Zhang, J., Ge, P., Duan, T., Zhou, J., Wu, Y., Zhang, Y., Liu, S., Liu, X., Wan, E., and Sun, X. 2024. "Application of Chatbots to Help Patients Self-Manage Diabetes: Systematic Review and Meta-Analysis," *Journal of medical Internet research* (26:10397), p. e60380.

Xue, H., Zhang, L., Shi, Y., Zhang, H., Zhang, C., Liu, Y., Tan, W., and Liu, Y. 2025. "The Effectiveness of Digital Health Intervention on Glycemic Control and Physical Activity in Patients with Type 2 Diabetes: A Systematic Review and Meta-Analysis," *Front Digit Health* (7), p. 1630588.

Zhang, C., Lakens, D., and WA, I. J. 2021. "Theory Integration for Lifestyle Behavior Change in the Digital Age: An Adaptive Decision-Making Framework," *J Med Internet Res* (23:4), p. e17127.

Zhang, J., Oh, Y. J., Lange, P., Yu, Z., and Fukuoka, Y. 2020. "Artificial Intelligence Chatbot Behavior Change Model for Designing Artificial Intelligence Chatbots to Promote Physical Activity and a Healthy Diet: Viewpoint," *Journal of medical Internet research* (22:9), pp. e22845-e22845.

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Summary

This study addresses the theory-to-design gap in digital wellness by translating motivational and compassionate care principles into operational system mechanisms. Using Design Science Research Methodology, the MiCARE prototype integrates Self-Determination Theory and the CARE framework into a structured DR–DP–DF model. The system supports autonomy through personalised goal setting, competence through coaching and feedback, and empathy through conversational interaction. A formative usability evaluation demonstrated high usability, strong task completion, and high perceived empathy. The findings show that theory-driven design can be effectively operationalised in

digital wellness systems, contributing a transparent framework and a practical prototype for developing engaging, user-centred healthcare technologies.