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Evaluation of a Gamified Self-care Application for University Students using the Wheel of Sukr Framework

[1]Qhairul Heedayah Tamsor, [2]Nur Zuraifah Syazrah Othman,
[3]Nurhafiyah Hazwani Haris Fadzillah, [4]Masitah Ghazali & [5]Hao Xu
Faculty of Computing, Universiti Teknologi Malaysia, Malaysia

[*1]qhairulheedayah@graduate.utm.my
[2]zuraifah@utm.my
[3]hazwani1998@graduate.utm.my
[4]masitah@utm.my
[5]xuhao@graduate.utm.my
*Corresponding author

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ABSTRACT

Effective self-care practices are important for university students' well-being. However, many students struggle to sustain these practices due to low motivation with existing digital self-care tools. While gamification shows potential, its effectiveness is often limited by implementations that lack robust theoretical foundations or alignment with psychological and motivational theories. This study aims to utilise gamification to encourage university students to practice self-care. The study evaluates two versions of a self-care application prototype: Version A (without gamification) and Version B (with gamification), utilising the Wheel of Sukr framework. A pilot study was conducted to refine experimental procedures, followed by a main experiment with 20 undergraduate students. Data collection included pre-test forms, the User Engagement Scale-Short Form (UES-SF), the System Usability Scale (SUS), and qualitative feedback. Wilcoxon Signed-Rank tests showed significant differences favouring Version B ($Z = -2.354$, $p = 0.019$) for user engagement metrics, including focused attention, aesthetic appeal, and reward factors. Qualitative feedback indicates that students found gamification elements such as points, badges, and weather-based recommendations engaging, though some noted the added complexity as a usability challenge. The average SUS score for Version B was 80.63, indicating high usability. The findings suggest that adapting the Wheel of Sukr framework may

provide a structured design approach for integrating gamification into student self-care applications, enhancing engagement while maintaining usability. This approach offers practical implications for the design of future theory-driven digital health interventions.

Keywords: Gamification, self-care, university students, user engagement, Wheel of Sukr.

INTRODUCTION

The well-being of university students depends on their ability to practice effective self-care to support their physical and mental health (Simerly & Blackhart, 2021). Despite an increasing awareness of the benefits of self-care, students often neglect these activities due to demanding academic schedules and insufficient motivation (Simerly & Blackhart, 2021; Slemon et al., 2021). Recent studies indicate that academic stress is a primary factor contributing to the deterioration of mental health among undergraduates, as students who impose excessive pressure on themselves exhibit heightened symptoms of depression and anxiety (Barbayannis et al., 2022; Córdova Olivera et al., 2023). Students who fail to manage their expectations often experience emotional exhaustion and disengagement, leading to neglect of their personal well-being activities (Zhang et al., 2025). Moreover, the widespread use of social media has raised new concerns about its adverse effects on their mental health and daily routines. Students who spend too much time online are distracted from academic work, and healthy routines become less accessible, which intensifies their anxiety and stress levels (Kolhar et al., 2021; Qin et al., 2025).

Digital self-care tools offer potential pathways for students to manage their stress while developing healthy habits independently. However, multiple studies have indicated that most students stop using these tools due to uninspiring designs, a lack of interactive features, or limited personalisation (Jakob et al., 2022; Mohd Johari et al., 2025). Many users abandon wellness applications after a single use, and even fewer continue using them regularly (Jakob et al., 2022; Mohd Johari et al., 2025). Furthermore, in Malaysia, where digital health adoption faces challenges due to habits and low sustained engagement (Mohamad Noor et al., 2023), building self-care solutions that are personally meaningful and emotionally appealing is crucial to promote long-term use. Thus, the significant challenge is keeping users engaged, for which gamification has emerged as a promising solution. Research has shown that gamification in mobile health applications can keep users engaged through elements such as points, badges, challenges, and social interactions (Fadzillah et al., 2023). By integrating gamified applications, users' psychological needs for autonomy, achievement, and relatedness can be satisfied, leading to positive health behaviours and emotional well-being (Nicolaidou et al., 2022).

Gamification frameworks can provide structured strategies to design a gamified self-care prototype. The Wheel of Sukr framework proposed by AlMarshedi et al. (2015) is one such example, initially designed to support diabetic self-management but subsequently expanded and validated in other health contexts (Fadzillah et al. 2025; Fadzillah et al., 2023; Jakob et al., 2022). The framework provides a systematic way of integrating motivational, behavioural, and social factors into a self-management system. However, more empirical studies are needed to verify its effectiveness in self-care contexts. By developing and testing the self-care application prototype into two versions: one without gamification and one with gamification influenced by the Wheel of Sukr, this study contributes to this area of focus by comparing user engagement between the two versions and presenting practical outcomes for designing digital self-care tools that can support the well-being of university students.

RELATED WORKS

Self-care Practices

Self-care plays a vital role in helping university students cope with academic life. It includes daily activities that help to promote physical, emotional, and mental well-being, such as sleeping enough, eating well, and taking breaks as needed. Martinez et al. (2021) define self-care as the ability to take care of oneself through awareness, self-control, and self-reliance. These qualities not only help students to maintain their health but also enhance their ability to handle stress. A healthy mental environment not only supports emotional well-being but also enhances concentration and resilience, both of which are important for handling academic challenges. As Garcés et al. (2024) note, interventions that promote psychological well-being can help students develop practical coping skills and adopt a more balanced, sustainable approach to university life.

There are plenty of ways in which students can practice self-care. Physical exercise reduces stress and improves focus, and mindfulness practices such as meditation promote emotional calmness and relaxation (Koo et al., 2024; Lin & Gao, 2023). Even simple practices, such as water consumption or using a step-tracking application, have been linked to better mood and focus (Ray et al., 2020; Spadola et al., 2023). These small but meaningful habits can add up in the long term and produce long-term effects on both academic performance and psychological well-being. Research also shows that students who engage in self-care daily feel more in control and experience higher levels of positive affect (Miller et al., 2023). However, self-care is often neglected when deadlines pile up or motivation drops, especially when students consider it a lower priority than their academic work (Al-Abyadh & Abdel Azeem, 2022; Auttama et al., 2021).

Despite knowing the benefits, many students still struggle to maintain self-care activities regularly. A reason is that academic pressure can be overwhelming, and it is hard to find time or energy for wellness activities (Ferrari et al., 2022; Jackson et al., 2024). In some cases, students may not feel supported in their efforts or may feel socially disconnected, which lowers their motivation to prioritise personal well-being (Hyseni Duraku et al., 2024; Park et al., 2020). When students are not engaged or motivated, they will be less likely to see self-care as a valuable practice. Introducing interactive methods can help in enhancing students' motivation to practice self-care. Students are more willing to attend to their own well-being, resulting in greater academic achievement and personal growth.

Gamification

Gamification is increasingly being identified as an effective mechanism for promoting healthy habits, such as self-care. Gamification applies game-like elements, such as points, badges, and leaderboards, to non-game contexts to make them more engaging (Pardos et al., 2022). Gamification leverages psychological and behavioural elements to motivate users to maintain habits that promote their well-being (Berglund et al., 2022). There is substantial evidence backing the effectiveness of gamification in driving behaviour change, particularly in the context of health and well-being. For example, Rodríguez Ferrer et al. (2024) demonstrated that a Points-Badges-Leaderboard (PBL) gamification system effectively nudged young individuals toward healthier behaviours. Likewise, incorporating motivational elements into repetitive tasks enhances users' ability to sustain or alter their behaviours to achieve goals more consistently (AlMarshedi et al., 2016).

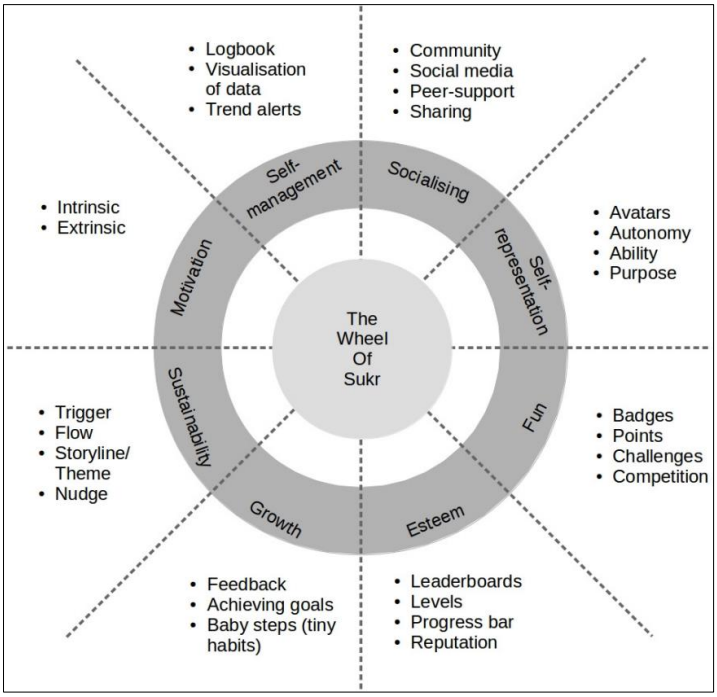
Self-care activities such as exercise and meditation can also be promoted by increasing potential interactivity and enjoyment, in addition to gamifying the system and process. One study found that users favoured the gamified version of a stress management application, and the added enjoyment correlated with improved stress management outcomes (Fadzillah et al., 2023). This user feedback highlights how gamification features can be utilised to foster emotional wellness alongside physical health. In addition to its gamification features, it has been shown to increase intrinsic motivation by enhancing feelings of autonomy and relatedness, which are linked to the formation of sustained, long-term habits (Li et al., 2024). With growing interest in gamified interventions comes an increasing need for thoughtful, effective implementation. To ensure quality outcomes, gamification strategies cannot be indiscriminately deployed; they are theory-guided models that inform design decisions. One potential framework that could serve as a guide, utilising the system features, motivational, behavioural, and social elements within gamified health systems, is the Wheel of Sukr.

The Wheel of Sukr

The Wheel of Sukr is a conceptual framework designed to facilitate the use of gamification features in self-management settings. It was developed for diabetic patients to facilitate behaviour change and develop habits of well-being and social interaction (AlMarshedi et al., 2015). The framework has been subsequently developed and refined to suit different health environments. The applicability of the framework was demonstrated by Fadzillah et al. (2025) through its improvement for psychological rehabilitation in disease management, suggesting its suitability for broad utilisation. Through combining gamification elements with behaviour techniques, the framework provides a structured approach to developing health interventions that are sustainable and interactive (AlMarshedi et al., 2016). While the framework emerged from healthcare, its key ideas are relevant to university students managing their well-being. Figure 1 illustrates the Wheel of Sukr framework.

Figure 1

The Wheel of Sukr Framework (AlMarshedi et al., 2016)



The framework consists of eight elements: motivation, self-management, socialising, self-representation, fun, esteem, growth, and sustainability. Each of these targets an important area of psychological support or personal development. Motivation distinguishes between intrinsic and extrinsic motivators that drive user behaviour. Self-management involves habit monitoring, trend-spotting, and actively managing one's well-being. Socialising promotes bonding through peer support or virtual groups, whereas self-presentation offers identity-building and customisation. Fun is introducing game elements such as rewards and challenges to make routines more enjoyable. Esteem provides a sense of achievement by using progress bars and other feedback mechanisms to encourage users to keep working toward their objectives. Growth targets small changes and goal achievement, while sustainability focuses on reuse triggered by reminders or achieving flow states.

Research evidence suggests that all these elements are relevant in fostering user engagement. For example, McClincy et al. (2021) found that motivation, self-management, and esteem were the key factors in user satisfaction with growth and fun, followed closely. These insights imply that when gamified systems combine motivational and interactive elements, users will be more engaged in a meaningful way. Additionally, research suggests that specific features such as points, levels, and challenges are generally considered popular when applied in gamified health applications (Al-Rayes et al., 2022). These factors can then be seen as effectively represented in the elements of the Wheel of Sukr, enabling designers to create more meaningful and impactful experiences. Overall, the framework offers a comprehensive guide for designing gamified interventions for supporting students in maintaining long-term self-care behaviours and positive well-being outcomes.

Despite the evidence discussed earlier that gamification boosts engagement with digital health tools and that the Wheel of Sukr provides a comprehensive framework for behaviour change, a gap remains in applying this framework to university student self-care. Current research on gamification primarily examines clinical populations, including diabetes management and general wellness tools, yet they lack robust theoretical frameworks (AlMarshedi et al., 2016; Jakob et al., 2022; Mohd Johari et al., 2025). While gamification elements, such as points and badges, show potential, their effectiveness remains limited because they are often implemented without alignment with psychological or motivational theories (Al-Rayes et al., 2022). Furthermore, there is a lack of empirical studies comparing gamified and non-gamified versions of self-care tools across student populations, especially when these tools incorporate context-aware features, such as weather-based activity recommendations, within a validated framework. This study fills the gaps by (1) adapting the Wheel of Sukr framework to match university student self-care practices, (2) systematically mapping its eight elements of the Wheel of Sukr framework to the application prototype features, and (3) conducting a controlled within-subjects experiment to assess user engagement.

METHODOLOGY

Experimental Design and Data Collection Methods

This study was conducted to evaluate the effectiveness of gamification in promoting self-care among university students by integrating the Wheel of Sukr framework into a self-care application prototype. To achieve this, two versions of the prototype were developed: Version A (without gamification) and Version B (with gamification). The eight elements of the Wheel of Sukr were embedded in Version B, which exemplified how they are presented in the real world. Both versions also included OpenWeather API features to present unique, personalised activity suggestions based on accurate, real-time weather,

which may add contextual meaning to self-care pursuits. A mixed-methods approach was used to evaluate the impact of gamification on user engagement. Quantitative user engagement data were collected using the User Engagement Scale – Short Form (UES-SF) (O'Brien et al., 2018) to assess several engagement factors. The System Usability Scale (SUS) (Brooke, 1996) was used on Version B (with gamification to explore if the gamification elements could enhance ease of use and perceived usability of the prototype.

In addition to these instruments, further analysis was conducted to better understand the effects of gamification better. The Shapiro-Wilk test was first used to determine the normality of each factor of the user engagement data distribution. After determining normality, the non-parametric Wilcoxon Signed-Rank test was used as it provides statistical testing for small or non-normally distributed samples. The Wilcoxon Signed-Rank test was used to investigate whether there were significant differences in engagement levels between Version A and Version B. Statistical Package for the Social Sciences (SPSS) was used to interpret the data and to organise student perceptions and behaviours. To complement the quantitative results, semi-structured interviews were also conducted to gain further qualitative insights into students' experiences with both prototypes. This mixed-method approach would help develop a better understanding of how gamification could influence user engagement when guided by a theory-based framework.

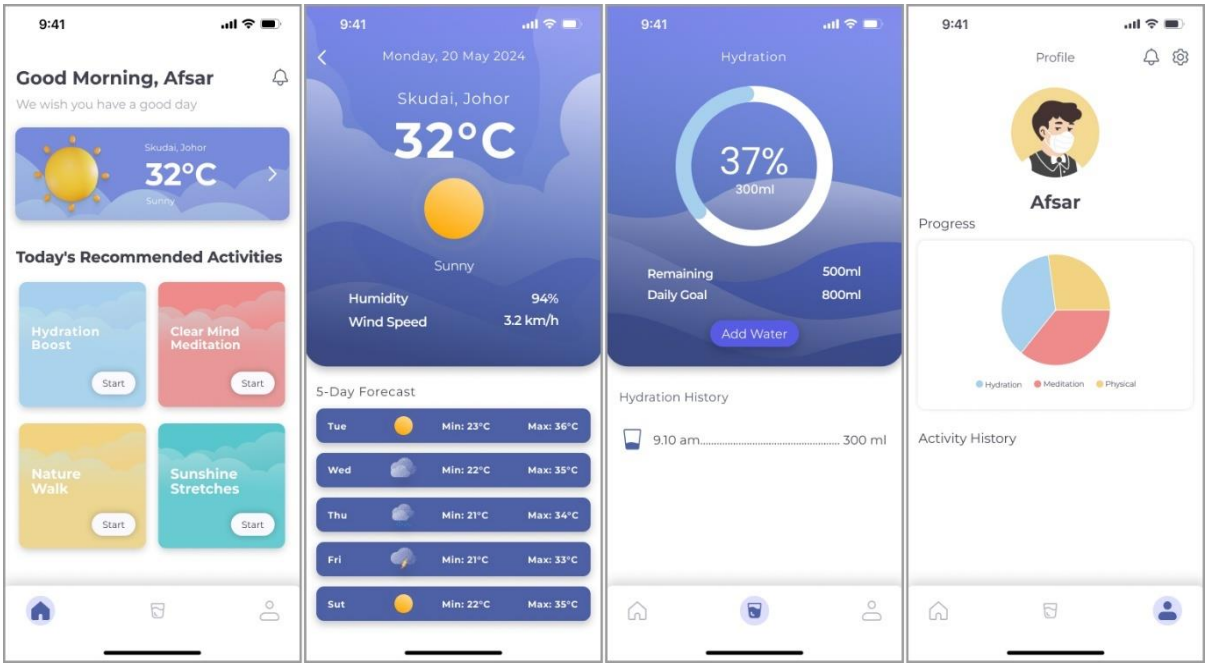
Version A Application Prototype Development

Version A of the application prototype was developed to provide a basic self-care experience, focusing on core well-being functionality. The prototype's design was driven by existing applications like SuperBetter (SuperBetter, 2023) and Happify (Happify, 2022). These applications are indicative of core functions that users value in self-care applications, including the structure of activities, the ability to track progress, and user-friendly interfaces (Burns & Voida, 2023; Kabacińska et al., 2022). The main features of the prototype include real-time weather updates, activity suggestions, and hydration tracking. As illustrated in Figures 2(a)–2(d), the interface is divided into four main pages. The home page (Figure 2(a)) displays the current weather and lists four activity suggestions. The user can navigate to the Weather page (Figure 2(b)) to view the current forecast and a five-day forecast. The Hydration page (Figure 2(c)) offers a space for users to log their water consumption and view their hydration timeline. Lastly, the Profile page (Figure 2(d)) displays progress summaries such as activity finishing and hydration achievements.

In addition to the main pages, Version A includes an activity section that guides users through selected self-care activities. As shown in Figure 3(a), the page offers activity options such as "Hydration Boost" and "Clear-Mind Meditation," each with simple step-by-step instructions. When the user chooses an activity from the Home page, the prototype provides a guide to help users complete it (Figures 3(a) and 3(b)). To support time-based practices, a timer indicator (Figure 3(c)) is also included, allowing users to keep track of time. Once completed, a Completion page (Figure 3(d)) is shown. Navigation is uniform throughout the prototype, making it easy for users to switch between pages.

Figure 2

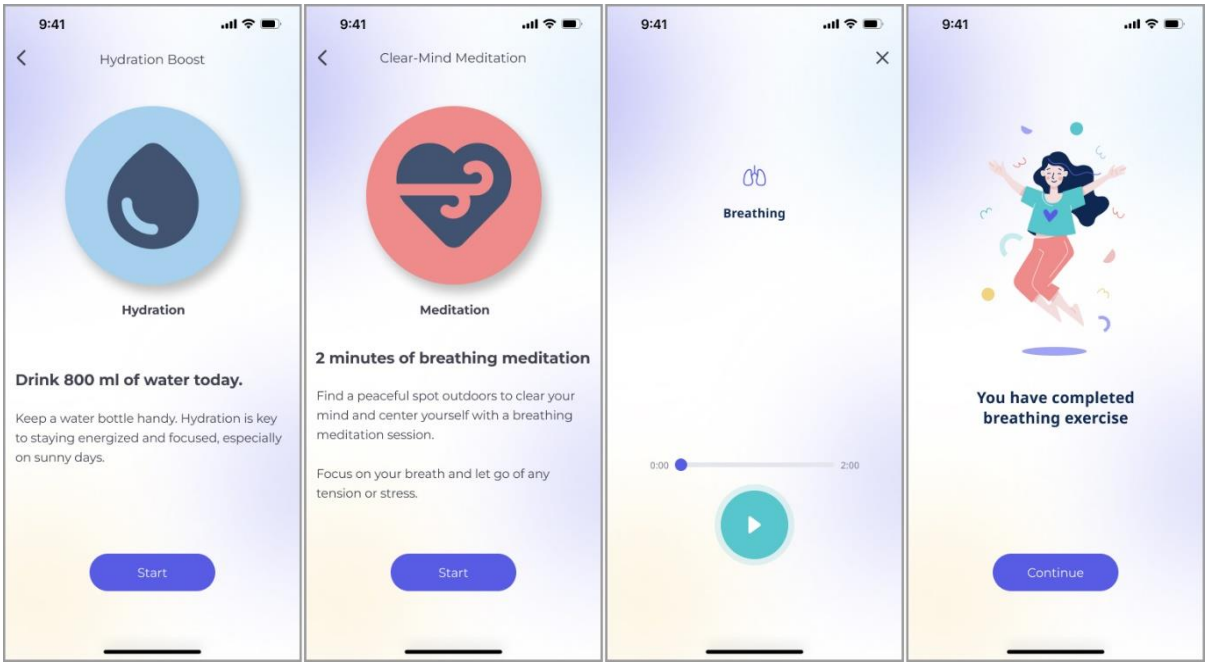
Version A's Interface



(a) Home *(b) Weather* *(c) Hydration* *(d) Profile*

Figure 3

Version A's Activity Interface



(a) Hydration Activity *(b) Meditation Activity* *(c) Timer Indicator* *(d) Activity Completion*

Mapping of Framework Elements in Version B

Table 1 illustrates how the Wheel of Sukr framework is mapped into the Version B self-care application prototype, aiming to encompass all self-care elements, enhance user engagement, and promote healthy behaviours.

Table 1

Framework Elements Mapping

Framework Element	Application Functionality	Description
Self-management	Logbook, visualisation of data	Tracks water intake and shows progress with charts.
Self-representation	Avatars, autonomy, ability	Users pick avatars and set water goals.
Fun	Badges, points, challenges	Earn points or badges for weather-based activities.
Esteem	Progress bar, achieving goals	Shows completed activities and clear goals.
Growth	Tiny habits	Large activities are broken into manageable activities.
Motivation	Extrinsic, intrinsic	Virtual rewards highlight personal gains.
Socialising	Community, peer support, sharing	Forums to share progress and mutual support.
Sustainability	Nudges, triggers	Sends reminders and motivational messages.

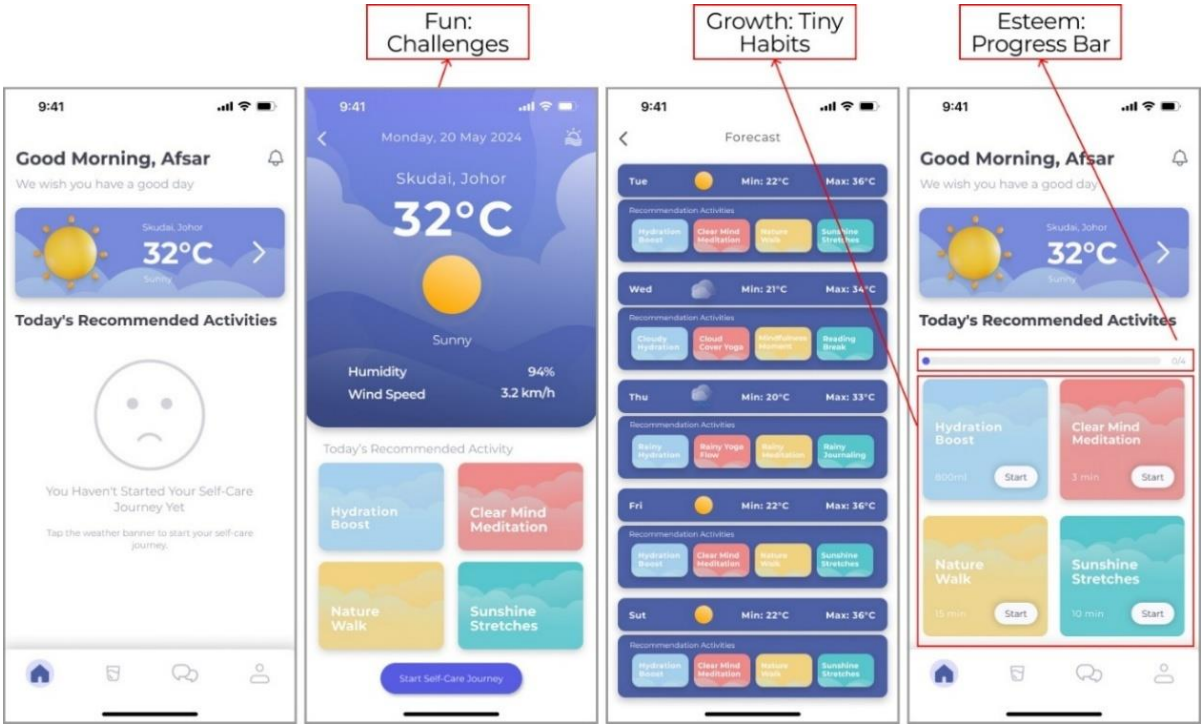
Version B Application Prototype Development

Version B of the prototype builds on Version A's basic features by adding gamification elements based on the eight elements of the Wheel of Sukr: self-management, self-representation, enjoyment, esteem, growth, motivation, socialising, and sustainability. While it retains essential features such as weather-based activity suggestions and hydration tracking, Version B introduces gamified features. As illustrated in Figure 4(a), the home page starts as an empty page, encouraging users to proactively initiate their self-care journey. They are first directed to the Weather page (Figure 4(b)) and the five-day Forecast page (Figure 4(c)), which display real-time and future weather-based activity suggestions. Upon starting the journey, the home page reloads (Figure 4(d)) to display daily activity recommendations based on live weather conditions, along with a progress bar that fills as activities are completed. Activities range from hydration, meditation, physical activities, and socialising to offer a complete self-care experience tailored to individual needs and preferences. The progress bar will fill as daily activities are completed.

To support task completion, each activity provides clear instructions and a goal. For example, meditation activities are shown in Figure 5(a), three other activities for the hydration, physical, and social activity categories. These activities are supported by indicators such as input fields, timers, or breathing cues. Additionally, subtle animations were used. For example, as the user logs water consumption, the water level graphically rises or falls in a circular pattern (Figure 5(b)). A circle also grows after inhalation and shrinks during exhalation to guide the user through the breathing exercise (Figure 5(c)). Users are shown motivational messages (Figure 5(d)) after logging their water consumption to encourage their progress, which are sustainability nudges.

Figure 4

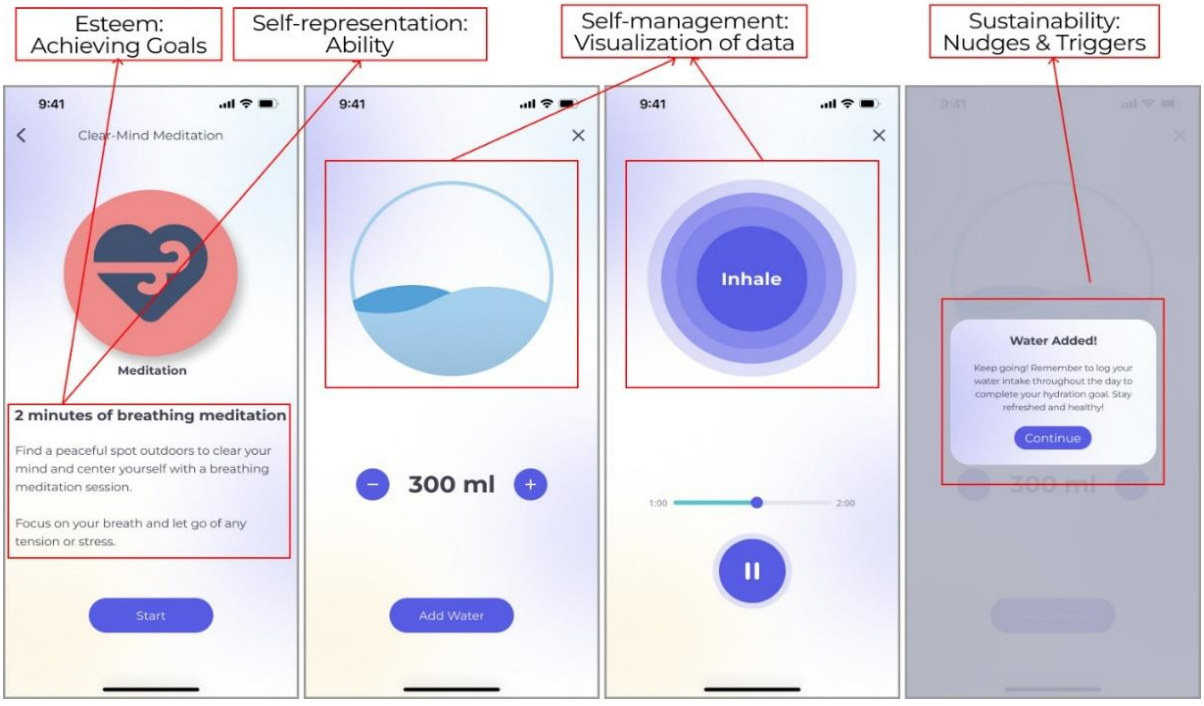
Version B's Interface



(a) Home *(b) Weather* *(c) Forecast* *(d) Home (After Start)*

Figure 5

Version B's Activity Interface

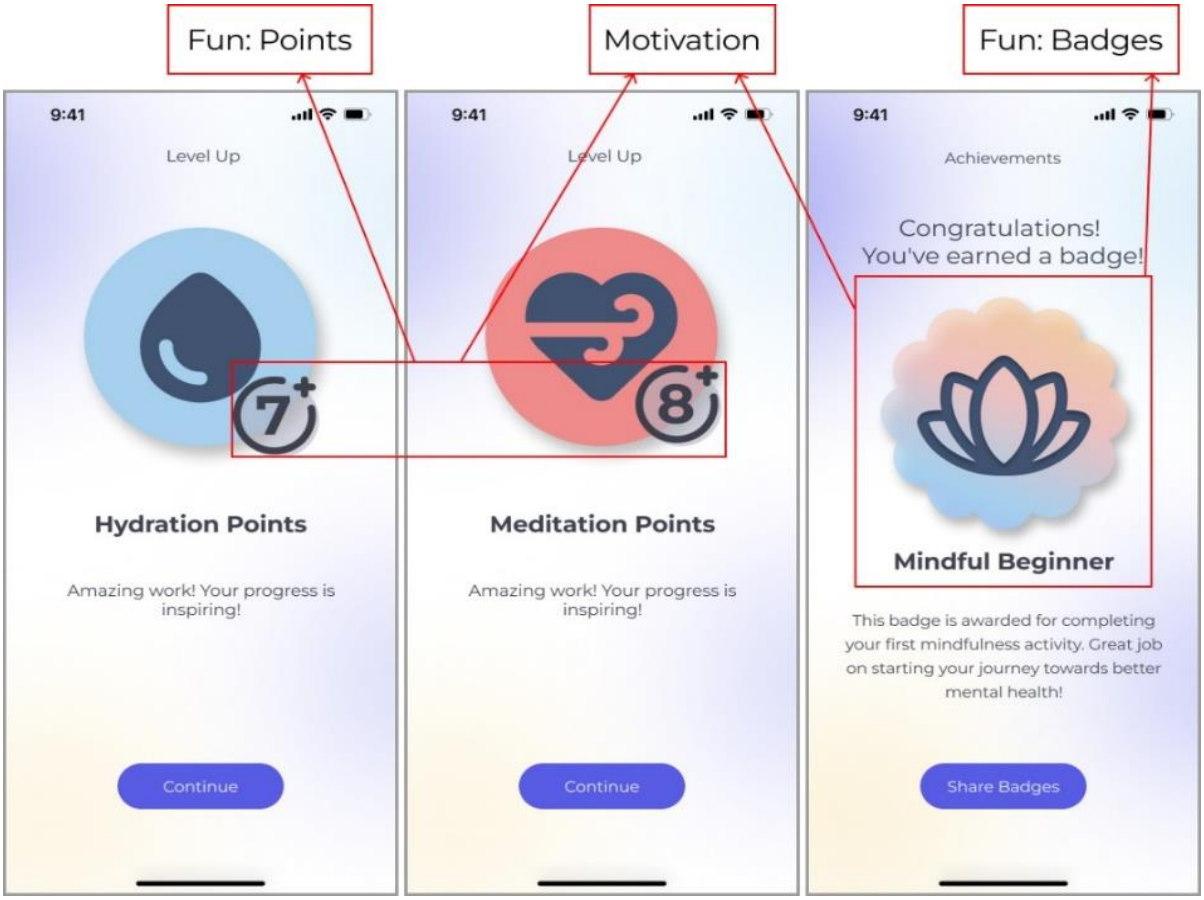


(a) Meditation Activity *(b) Hydration Indicator* *(c) Meditation Indicator* *(d) Trigger*

The prototype includes reward systems based on the Wheel of Sukr's 'fun' elements. The prototype assigns points for various activities, including hydrations (Figure 6(a)), meditation (Figure 6(b)), exercise, and socialising. Point distribution was randomised for this prototype to mimic a dynamic reward system. Points earned accumulate toward badge grants (Figure 6(c)), which reward users' progress and help maintain motivation. These features are designed to give users a sense of reward and accomplishment, encouraging them to return daily and maintain regular self-care practices. Users can move on to another activity after completing one.

Figure 6

Version B's Points and Badges Interface

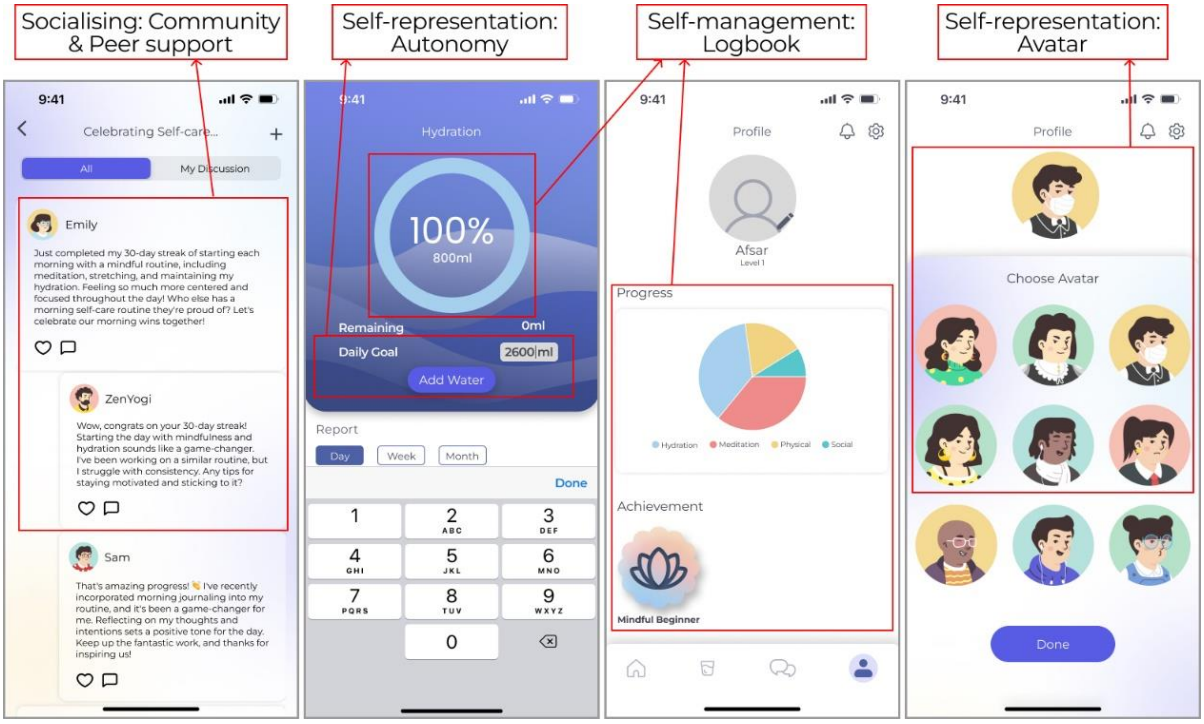


(a) Hydration Point *(b)Meditation Point* *(c) Badges*

In addition to activity tracking and rewards, Version B encourages social interaction and self-representation. Users can share their badges, celebrate milestones, and discuss through the Forum page, as shown in Figure 7(a). The ability to like, comment, or start a new discussion adds an element of community support that deepens socialising and sustainability. Meanwhile, users can track their water consumption (Figure 7(b)), which displays the water intake remaining goal and allows them to set their daily water intake goal. The profile page (Figure 7(c)) provides an overview of progress across all activity types, including hydration, physical activity, social, and meditation. Also displays all badges earned for quick reference. A customisable avatar (Figure 7(d)) is also included in the profile, allowing users to choose an avatar that represents them visually.

Figure 7

Version B's Additional Features Interface



(a) Forum's Discussion *(b) Hydration* *(c) Avatar* *(d) Profile*

Measures and Participants

To measure user engagement, the UES-SF (O'Brien et al., 2018) was used as the questionnaire for both versions. The UES-SF is a short version of the UES and uses fewer items than the original UES, while still effectively measuring user engagement (O'Brien & Toms, 2010; O'Brien et al., 2018). The UES–SF questionnaire was handed to the participants upon completion of each version of the self-care application prototype. The questionnaire has 12 items measuring user engagement across four dimensions: focused attention (FA), perceived usability (PU), aesthetic appeal (AE), and reward (RW) (O'Brien et al., 2018), as detailed in Table 2 below.

The System Usability Scale (SUS) was used to measure usability (Brooke, 1996), specifically in Version B, to assess whether the inclusion of gamification factors enhances the prototype's overall usability. The SUS is a validated, standardised measure of system usability that complements the UES-SF's understanding of user engagement. Additionally, SUS has a 10-item scale measuring learnability, satisfaction, and usability. Table 3 presents the SUS questionnaire. Both questionnaires used a 5-point Likert Scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) (Brooke, 1996; O'Brien et al., 2018).

Table 2

The UES – SF Questionnaire (O'Brien et al., 2018)

Factor	Item	Questions
Focused attention (FA)	FA-S.1	I lost myself in this experience
	FA-S.2	The time I spent using this prototype just slipped away
	FA-S.3	I was absorbed in this experience
Perceived usability (PU)	PU-S.1	I felt frustrated while using this prototype
	PU-S.2	I found this prototype confusing to use
	PU-S.3	Using this prototype was taxing
Aesthetic appeal (AE)	AE-S.1	This prototype was attractive
	AE-S.2	This prototype was aesthetically appealing
	AE-S.3	This prototype appealed to my senses
Reward (RW)	RW-S.1	Using this prototype was worthwhile
	RW-S.2	My experience was rewarding
	RW-S.3	I felt interested in this experience

Table 3

The SUS Questionnaire (Brooke, 1996)

No	Question
1.	I think that I would like to use this system frequently
2.	I found the system unnecessarily complex
3.	I thought the system was easy to use
4.	I think that I would need the support of a technical person to be able to use this system
5.	I found the various functions in this system were well integrated
6.	I thought there was too much inconsistency in this system
7.	I would imagine that most people would learn to use this system very quickly
8.	I found the system very cumbersome to use
9.	I felt very confident using the system
10.	I needed to learn a lot of things before I could get going with this system

The study hypotheses were designed to test the effect of gamification on users' participation in self-care application prototypes. The null hypothesis is: *H0: There is no significant difference in user engagement levels between Version A (without gamification) and Version B (with gamification).* This null hypothesis was developed to determine whether gamification would contribute to measurable increases in user interaction. Previous literature has already shown that points, challenges, and social features can foster intrinsic motivation and user engagement with health-based applications (Fadzillah et al., 2023; Rodríguez Ferrer et al., 2024). Since the impact of gamification can depend on context and use, this investigation sought to test this assertion using empirical measures and user feedback.

The study involved 20 undergraduate students from Universiti Teknologi Malaysia (UTM), aged 18 to 25. The participants were selected because they were the intended target users of the gamified self-care application prototype. Participants were selected from different academic years and faculties to represent a broad range of experiences and perspectives in the study. This diversity ensured the reliability of the data and a comprehensive evaluation of the prototype.

Pilot Test and Main Experiment

A two-day pilot test took place at UTM with two undergraduate students as participants. The initial testing stage revealed potential problems while confirming that the study procedure would run without issues. The students began by signing consent forms, then completed a short pre-test survey for background information. One student began with Version A, and the other began with Version B, thereby keeping exposure equivalent between the two versions. Students completed the tasks allocated to them with the version they were provided before answering the UES-SF questionnaire, and then they repeated the same procedure with the other version. The pilot test helped identify confusing words and highlighted areas for improvement in both the task instructions and the prototype interface design. The main experiment began after researchers applied the discovered insights to create minor improvements that enhanced clarity and consistency.

The main experiment took place at UTM, where 20 undergraduate students who matched the target audience for the self-care application prototype participated. The two undergraduate students who participated in the initial pilot test did not join the main experimental study. The study employed a within-subjects design, requiring each participant to experience both Version A (without gamification) and Version B (with gamification). The research design enables the evaluation of participant engagement between two conditions through direct comparisons using the same participants. The research design enables systematic evaluation of user engagement across multiple prototype versions (Liu et al., 2024; Thieme et al., 2025). Students were randomly assigned to two groups to minimise any order effects. To mitigate order effects and potential biases, the interaction sequence with Versions A and B was counterbalanced. The first group, consisting of ten students, started with Version A, followed by the second group, which began with Version B. Students completed the consent forms and pre-test forms before starting the task. Students completed the user tasks with their assigned version first, and then completed the UES-SF. The procedure was then repeated for the second version. After completing both versions, students completed the SUS for Version B and a post-test. Semi-structured interviews were conducted to gather further information about their experience. The mixed-methods approach of qualitative data collection and quantitative feedback provided insight into how the prototypes supported users' engagement and promoted self-care.

RESULTS AND DISCUSSIONS

Participant Demographics

The study included 20 undergraduate students from UTM, aged 19-24 years, with 13 female and 7 male participants. In terms of academic standing, participants were distributed across the academic years: 10% in Year 1, 20% in Year 2, 30% in Year 3, and 40% in Year 4, reflecting a wide range of academic experiences and perspectives. The participants also came from several faculties at UTM, broadening the sample. The Faculty of Computing had the highest representation, with 50% of participants, followed by the Faculty of Chemical and Energy Engineering with 20%, and the Faculty of Built

Environment and Surveying and the Faculty of Social Sciences and Humanities, each with 15%. Regarding prior experiences with self-care and wellness applications, 45% had previously used self-care or wellness applications, while 55% had not. Responses ranged in terms of their familiarity with gamification concepts, with 10% describing themselves as "Not Familiar," 60% as "Somewhat Familiar," and 30% as "Very Familiar". This diversity in background and experience supports a multifaceted evaluation of the prototypes.

User UES-SF Score

User engagement was assessed using the UES-SF (O'Brien et al., 2018), a validated 12-item questionnaire that measures four key dimensions: FA, PU, AE, and RW. The UES-SF was selected as a validated, concise instrument designed for assessing user engagement in digital environments, with demonstrated use in mobile health and gamified wellness applications (Bitrián et al., 2021; Fadzillah et al., 2023). The FA score for Version A was 3.22 (SD = 0.64), indicating that students were somewhat engaged but not fully immersed. In contrast, Version B had a mean FA score of 3.85 (SD = 0.80), which demonstrated that the gamified version successfully retained focus. The interactive features of Version B, including badges and goal-based activities, likely contributed to its superior engagement levels. The results demonstrate that gamification positively affects student engagement in their self-care activities. Meanwhile, PU scores were positive for both versions. The usability ratings for Version A are 3.90 (SD = 0.89), and Version B received a slightly higher score of 3.98 (SD = 0.81). While PU's mean score was nominally higher for Version B, the difference between the versions was not statistically significant.

Table 4

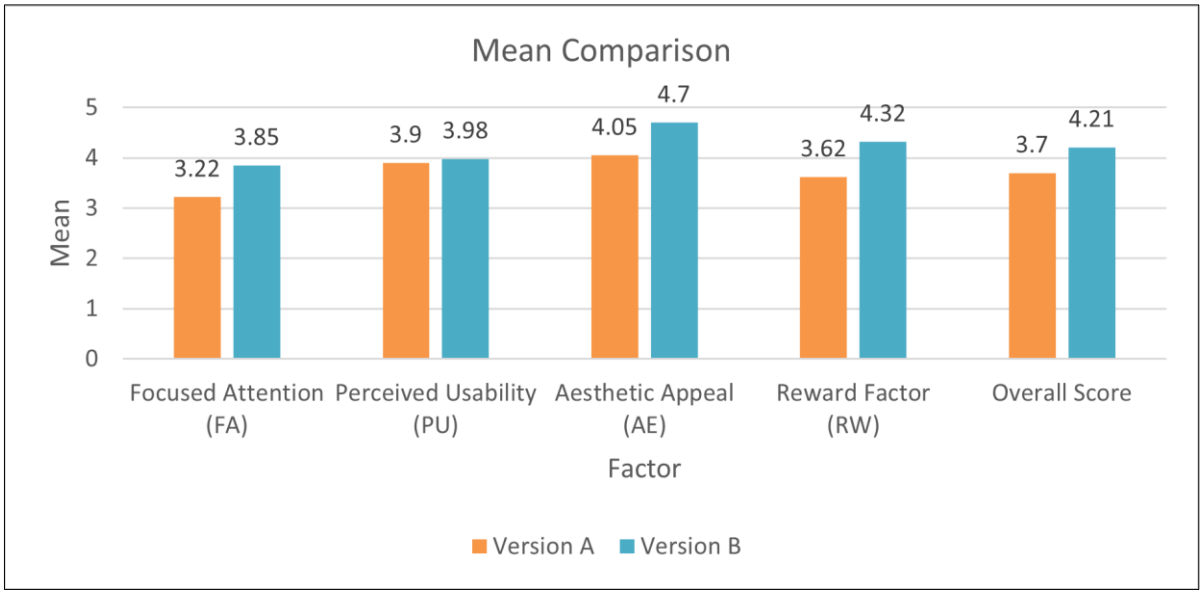
Score of each Factor for Version A and Version B

Factor	Version A			Version B		
	Total	Mean	SD	Total	Mean	SD
FA	64.33	3.22	0.64	77.00	3.85	0.80
PU	78.00	3.90	0.89	76.67	3.98	0.81
AE	81.00	4.05	0.87	94.00	4.70	0.47
RW	72.33	3.62	0.91	86.33	4.32	0.63

The two versions showed the greatest variation in AE ratings. The students rated Version A as visually pleasing and clean, giving it a score of 4.05 (SD = 0.87). The students rated Version B as more visually appealing and immersive, with a mean score of 4.70 (SD = 0.47). The interactive features of personalised avatars and visual indicators, together with animated task feedback, made the experience more engaging, thereby strengthening its appeal. As for RW, students evaluated Version A's RW at 3.62 (SD = 0.91), which indicated they found some value in the prototype. However, the experience did not provide a strong sense of accomplishment. On the other hand, students demonstrated higher satisfaction, as indicated by Version B's score of 4.32 (SD = 0.63). The implementation of gamified rewards through progress tracking and digital badges produced this outcome. The elements created a feeling of accomplishment, making the activities more significant.

Figure 8

Mean Comparison for each Factor for Version A and Version B



Overall, students maintained a consistent experience at a modest level, with an overall engagement mean of 3.70 in Figure 8 for Version A (without gamification). In contrast, the basic functionality and weather-based recommendations did not compensate for the lack of stimulating feedback or game elements, making the experience less engaging over time. In contrast, the overall mean for Version B (with gamification) was 4.21, indicating that students became more emotionally engaged and demonstrated greater interest. The enhancements in FA, AE, and RW demonstrate how gamification improved students' concentration and enjoyment, as well as their perception of value. These findings support the idea that gamified elements serve more than aesthetic purposes, as they maintain student motivation and prevent them from abandoning self-care practices. Version B achieved better results in creating an engaging user experience by combining visual elements with reward systems and meaningful user interactions.

Statistical Analysis Selection and Wilcoxon Signed-Rank Test

Before conducting a comparative analysis, the normality of the user engagement data for both Version A and Version B was assessed using the Shapiro-Wilk test. The aggregate data across all factors for Version A ($W = 0.878$, $p = 0.017$) indicate non-normality, whereas Version B ($W = 0.956$, $p = 0.475$) shows normality. The Wilcoxon Signed-Rank test was selected for user engagement comparison between Version A and Version B. The test is suitable for paired data where normality cannot be assumed. The Wilcoxon Signed-Rank test results are presented in Table 5. The analysis of FA ($Z = -2.450$, $p = 0.014$) showed a statistically significant difference, indicating Version B had higher absorption and immersion levels than Version A. However, the test results showed no statistically significant difference in PU scores ($Z = -0.088$, $p = 0.930$). Therefore, the test results do not support the conclusion of a perceived usability difference between Version A and Version B. Adding gamification elements in Version B did not affect overall usability perception compared to Version A (without gamification).

Table 5

Wilcoxon Signed-Rank Test Result

Factor	Negative Ranks (N)	Positive Rank (N)	Ties (N)	Z Value	p-value
FA	5	12	3	-2.45	0.014
PU	9	9	2	-0.09	0.930
AE	2	13	5	-2.95	0.003
RW	3	15	2	-2.41	0.016
Overall	7	13	0	-2.35	0.019

Furthermore, AE (Z = -2.948, p = 0.003) showed a significant difference, with students finding Version B more visually appealing and aesthetically satisfying than Version A. The visual elements in Version B most likely contributed to this result. Similarly, RW (Z = -2.405, p = 0.016) also showed a significant difference, indicating that students found Version B more rewarding and worthwhile than Version A. The gamification elements, such as points, badges, and progress tracking, in Version B led to higher feelings of achievement and motivation. Overall engagement levels (Z = -2.354, p = 0.019) across all factors showed a significant difference, indicating that Version B was more engaging than Version A. The results reject the null hypothesis (H0) for FA, AE, RW, and overall engagement. The null hypothesis (H0) for PU was accepted because there was no significant difference in perceived usability between the two versions.

Comparative and Qualitative Discussion

The Wilcoxon signed-rank test found significant differences in FA, AE, and RW, and overall engagement, indicating that Version B outperformed Version A in these categories. The FA scores were significantly higher for Version B (Z = -2.450, p = 0.014) due to the specific gamification elements aligned with the Wheel of Sukr framework. The ‘growth’ elements were embodied in features such as ‘tiny habits’, which provided manageable tasks. The features ‘progress bar’ and ‘achieving goals’, which reflect the ‘esteem’ elements, provided clear objectives and immediate feedback. The structured method, based on the framework principles, successfully maintained user attention. It aligns with Fadzillah et al. (2023), who observed that goal-based gamification in stress-management apps significantly improved user absorption and time distortion. Similarly, Version B achieved a significant improvement in AE (Z = -2.948, p = 0.003) by incorporating personalised avatars, visually engaging animated feedback, and refined layouts that made the interface more engaging. The strong aesthetic response to avatars and animations echoes findings by Al-Rayes et al. (2022), who identified visual customisation as a driver of engagement in health gamification.

The substantial difference in RW (Z = -2.405, p = 0.016) confirms that the gamification elements targeting ‘motivation’ and ‘fun’ were highly effective. The points-and-digital-badges system provided students with concrete evidence of their accomplishments, aligning with Rodríguez Ferrer et al. (2024), who demonstrated that PBL systems effectively increase perceived reward in youth wellness applications. Importantly, these features tapped into core psychological needs: customisable goals and avatars supported autonomy, progress tracking and badges reinforced competence, and forum-based sharing addressed relatedness, key drivers of intrinsic motivation (Li et al., 2024; Nicolaidou et al., 2022). In contrast, PU showed no significant statistical difference between versions (Z = -0.088, p =

0.930). The results demonstrate an essential point about the 'self-representation' and 'socialising' elements of the Wheel of Sukr. The addition of sharing badges and adjustable hydration goals enhanced engagement but made the system more complex to use. Some students encountered slightly more difficulties when using Version B for navigation. The elements attempt to create long-term engagement through enjoyment, but their complexity may inadvertently undermine usability, suggesting a trade-off between motivational richness and ease of use.

To supplement the quantitative data from the UES-SF questionnaire, semi-structured interviews were conducted to explore students' (anonymised as P1–P20) experiences with the self-care application prototypes. Many students noted that the gamification elements improved their engagement by providing feedback and fostering a sense of accomplishment. As P8 shared, *"Seeing the progress go from 0/4 to 4/4 was really satisfying"*. Similarly, P7 remarked, *"The rewards made me want to complete the activities. It would be even better if there were real-world rewards I could claim"*, underscoring the appeal of extrinsic incentives. In contrast, P16 reflected on intrinsic motivation, "*As a user, I felt motivated at least I had a side goal to improve my health.",* indicating that gamification also supported personal purpose. The visual and interactive design also resonated strongly as P18 noted, *"I really like how the water level fills the circle when I log my intake, it feels responsive"*. Also, P10 appreciated the self-care recommendation system that adapts to weather conditions. One remarked, "*If I'm in the office and can't see the weather outside, the app's indoor activity suggestions guide me to do something useful*".

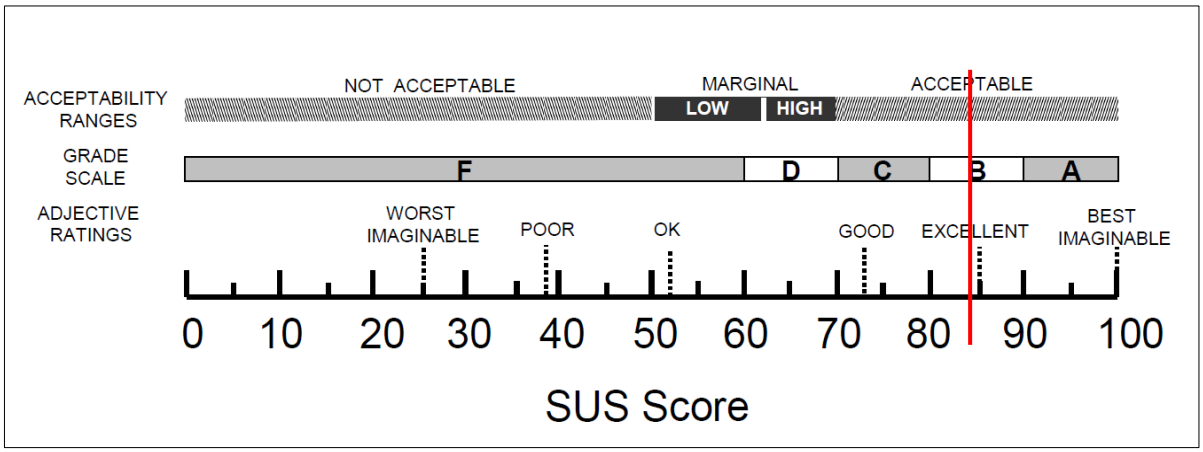
However, the Version B interface proved difficult for some users because it included operations not present in Version A. As P4 observed, *"Version B was a bit harder to navigate because of the extra tasks, but I still found it engaging".* This aligns with the non-significant difference in Perceived Usability (PU) scores, suggesting that added tasks such as badge sharing, and goal customisation introduced mild complexity without undermining overall engagement. Nevertheless, participants appreciated the personalisation features. As P19 commented, *"I liked choosing my avatar, I can choose which character matches my personality"*, illustrating how self-representation enhanced emotional connection. Overall, this qualitative feedback matched the quantitative findings from the UES-SF analysis. The interview confirmed that Version B's gamification elements increased user engagement across all four areas of FA, AE, RW and total engagement. The SUS was used to evaluate the overall usability of the gamified Version B application prototype.

Discussion on System Usability of Version B

The SUS evaluated the usability of Version B of a self-care application prototype with the same student. According to Brooke (1996), the scoring process requires separate calculations for odd- and even-numbered questions, which produce an objective SUS score to measure usability. The SUS scores ranged from 42.5 to 92.5, with an average of 80.63. According to the Bangor et al. (2009) adjective grading scale, illustrated in Figure 9, this average score corresponds to an "Excellent" rating. The score indicates that, even with the added complexity introduced by certain gamification features such as badge sharing, Version B successfully maintained a high level of perceived usability in its overall design and integration of these elements.

Figure 9

Grade Rankings of SUS Scores for Version B (Bangor et al., 2009)



CONCLUSION

This study demonstrates that utilising gamification elements in a self-care application guided by the Wheel of Sukr framework can have a meaningful impact on user engagement, as measured among university students. The findings show that core gamification elements in Version B positively influenced focused attention, aesthetic appeal, and rewards. It indicates that gamified elements and aesthetics can be used to engage a student's enjoyment of simple self-care practices, with potential consequences for adherence to those practices. Furthermore, it is possible to use frameworks to provide a systematic approach to embedding motivational and behavioural features into self-care apps. It helps to overcome barriers to consistency in self-care routines by providing an easily accessible means to enhance engagement. This study provides design guidelines for leveraging gamification in self-care applications using the Wheel of Sukr framework and suggests a way or position for balancing engagement and usability.

The main limitations of this study are its small sample size and its demographic limitations. This study used undergraduate participants enrolled at the same university. It substantially limits the study's generalisability and external validity. Therefore, even if the results are encouraging in this context, they may not reflect a larger population of university students. Another potential limitation identified in this study is the increased complexity of Version B's gamified nature. Even though Version B had better engagement, qualitative feedback mentioned that the extra tasks added complexity to the user experience. It may suggest that engagement in Version B comes at the cost of usability in the prototype, and subsequent iterations could address this by simplifying interactions or clarifying onboarding for complex features.

Future research should prioritise recruiting larger and more diverse participant pools, including students attending different institutions and potentially with different cultural or educational backgrounds, to validate and extend these preliminary findings. Additionally, incorporating washout periods between conditions could help mitigate potential order effects inherent in within-subjects experimental designs. Moreover, future research could examine how gamified systems can evolve and strategically adapt to users' differing needs and preferences over time. Exploring adaptive design strategies or intelligent

personalisation features could open opportunities for designers to engage with different mechanisms and further support sustained behavioural change. Extending these explorations into educational and broader wellness contexts could add relevance and long-term impact to gamified approaches.

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