

An mHealth Application for the Rehabilitation of Community-Dwelling Individuals With Chronic Mental Health Conditions: A Randomized Controlled Trial

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Abstract

Background: Developing a nursing service system to promote rehabilitation among individuals with chronic mental health conditions is essential for maintaining self-care and social functioning. This study examined the effectiveness of the BUU True Friends mobile application (mHealth) in enhancing rehabilitation and reducing relapse risk.

Methods: A two-arm, pretest–posttest randomized controlled trial (RCT) was conducted with 80 participants (aged 20–59) recruited from an outpatient service in Eastern Thailand. Participants were randomly assigned to an intervention group (n = 40) receiving standard care plus the mHealth app, or a control group (n = 40). Outcomes were assessed at baseline and after an eight-week intervention. Data were analyzed using ANCOVA, controlling for baseline gender, education, and pretest scores.

Results: After controlling for covariates, the intervention group showed significantly superior post-intervention scores in psychiatric rehabilitation domains, specifically self-care (p = 0.002), family (p = 0.015), relaxation (p = 0.025), and community functioning (p = 0.042). Additionally, the intervention group achieved significantly greater psychological well-being (p = 0.001) and lower psychiatric symptom severity (p = 0.002) than the control group. Longitudinal analysis confirmed significant improvements in medication adherence (p = 0.009) within the intervention group.

Conclusions: The BUU True Friends mHealth app is an effective digital nursing intervention for community-based mental health rehabilitation. Future research should evaluate long-term behavioral changes and caregiver involvement.

Keywords: Chronic mental health conditions, Nursing service system, Rehabilitation, Mental health intervention, Smartphone application

1. Introduction

Mental illness is a significant global public health concern, contributing to a substantial portion of the global burden of disease and placing immense pressure on healthcare systems worldwide [1]. In Thailand, the magnitude of this issue is evident; in fiscal year 2023, approximately 2.9 million individuals were reported living in communities with chronic mental health conditions—an increase of nearly 100,000 cases since 2019 [2]. This growing prevalence has led to a significant increase

in national healthcare expenditures, reaching 63.22 million Thai Baht [2]. Regionally, Eastern Thailand alone accounts for about 25,000 individuals who require continuous community-based monitoring and rehabilitation services [3].

Chronic mental health conditions often result in debilitating symptoms that impair essential life skills, including self-care, social relationships, stress regulation, and financial management [4]. While ongoing rehabilitation is vital for preventing relapse and promoting a quality of life comparable to the general population, substantial barriers limit access to

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sustained psychiatric rehabilitation [5]. The most critical barrier is a profound shortage of mental health personnel; Thailand has only 6.14 psychiatric–mental health nurses per 100,000 population [6]. Consequently, many individuals do not receive the necessary follow-up care, leading to a “revolving-door” phenomenon where patients frequently relapse due to discontinued treatment or ineffective stress management [7]. Furthermore, community nurses often face high caseloads and a lack of concrete standards, resulting in a practice that focuses primarily on symptom monitoring and medication administration rather than holistic recovery [8,9].

To address these community care gaps, contemporary psychiatric nursing shifts the focus from clinical risk management to empowering individuals through a rehabilitation perspective [7]. Grounded in a rights-based perspective, the goal of modern interventions is to restore self-care abilities and social functioning, ensuring that individuals can live independently and equitably within their communities [5]. Cumulative evidence suggests that rehabilitation programs rooted in recovery-oriented principles significantly improve daily functioning, reduce rehospitalization rates, and enhance interpersonal relationships [10,11].

To overcome workforce shortages and optimize the delivery of these recovery-oriented programs, digital health technologies, specifically mobile health (mHealth) applications, have emerged as promising solutions [12]. International literature indicates that mHealth interventions have shown promising effectiveness in enhancing treatment adherence, promoting self-management, and reducing clinical relapse among individuals with chronic psychiatric conditions [13]. Furthermore, systematic reviews show that over 80% of these individuals recognize the benefits of mHealth and are willing to use these tools daily [12]. In Thailand, while mHealth adoption is increasing, only 5.7% of available applications focus on mental health, and these are largely limited to basic assessment, psychoeducation, and referrals [14]. Despite the potential of digital health, there remains a distinct research gap regarding structured, nursing-led digital interventions specifically designed for comprehensive psychiatric rehabilitation [14]. Current practices lack standardized digital tools that integrate professional nursing care with a recovery-oriented framework to support sustainable community living.

To address this gap, the present study developed and evaluated the effectiveness of the BUU True Friends mHealth application, a nursing-led digital psychiatric rehabilitation intervention grounded in

the Recovery-Oriented Model, focusing on developing essential life skills—such as medication management, stress regulation, and social participation—to reduce the risk of relapse [15,16]. By equipping community mental health nurses with a standardized digital rehabilitation platform, this study offers a scalable and sustainable model for delivering recovery-oriented care, improving equitable access to psychiatric rehabilitation, and enhancing functional independence and quality of life among individuals living with chronic mental health conditions.

The conceptual framework of this study integrates the Recovery-Oriented Model [10], a psychiatric rehabilitation framework [17], and the Concept of Social Support [18] to systemically guide the development and implementation of the BUU True Friends mHealth application (Fig. 1). Grounded in these theoretical foundations, the recovery process is structured as a personalized trajectory where individuals actively identify needs across core rehabilitation life skill domains, including self-care, home living, social interaction, occupational/financial management, stress regulation, and community utilization [17,19]. Recognizing that sustained recovery also depends on effective relapse prevention, the conceptual framework was expanded to incorporate evidence-based self-care competencies, including psychiatric medication management, stress management, and substance misuse prevention [19,20]. To operationalize these domains, each skill target is translated into specific, interactive app functions—such as “Daily Activities,” “My Pillbox,” and the “Star Trading Game.” This operationalization converts abstract theoretical principles into structured daily tasks, thereby fostering patient autonomy and strengths-based goal attainment.

The mechanism linking these digital features to sustainable rehabilitation outcomes operates through a collaborative, multi-layered social support ecosystem. Within this platform, family caregivers provide critical emotional, informational, and appraisal support by supervising tasks and reviewing behavioral data, while community mental health nurses deliver clinical instrumental support via professional digital consultations. Dynamically, the application reinforces this ecosystem by leveraging continuous progress tracking and automated notifications, which function as behavioral cues to action. This synergy between user-driven digital engagement and multi-layered social support is hypothesized to mediate behavioral change, ultimately optimizing life skills, enhancing psychological well-being, maximizing medication adherence, and

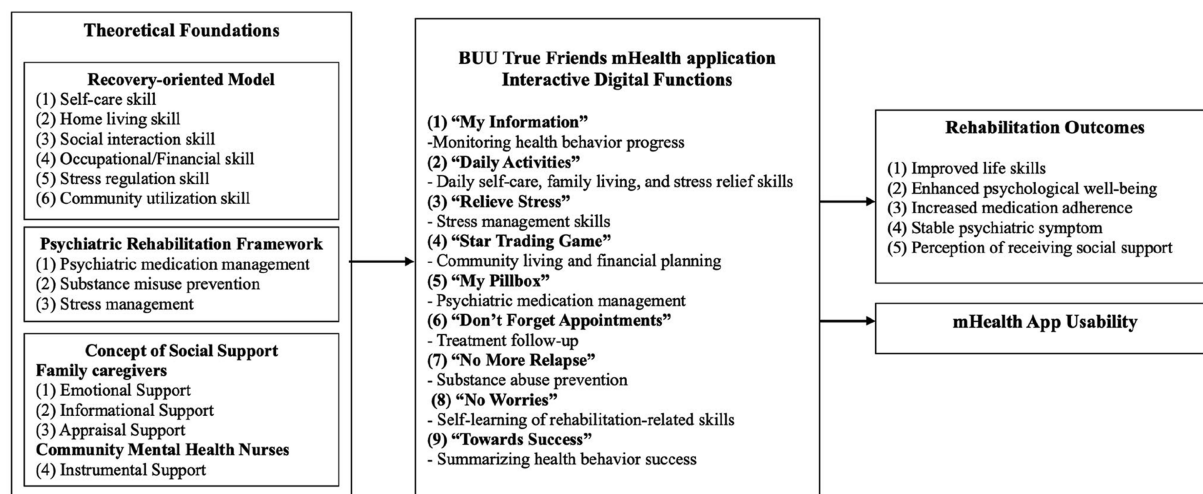


Figure 1. Conceptual frame work underlying the development of the mHealth application's functional features.

sustaining clinical symptom stability to prevent the “revolving-door” relapse.

2. Methods

2.1. Design

This study employed a two-arm, pretest–posttest randomized controlled trial (RCT) design with an intervention and a control group. The study report was prepared in accordance with the CONSORT Statement framework.

2.2. Population and sample

The target population comprised adults with chronic mental health conditions in Thailand. The accessible population consisted of individuals receiving outpatient care from the Drug Addiction and Community Mental Health Group at a tertiary hospital in Eastern Thailand in 2025. A sample size of 30 participants per group was initially determined based on Hongsanun and Insuk [21]. Accounting for an estimated 20% attrition rate, the final enrollment target was set at 80 participants.

The sampling and allocation process involved two distinct stages to ensure methodological rigor. First, trained nurses purposively selected participants from the accessible population attending follow-up care at the outpatient setting based on the established eligibility criteria (sampling strategy). Second, after securing informed consent, these 80 volunteers were randomly assigned (group allocation) using computer-generated random numbers into either the intervention group ($n = 40$) or the control group ($n = 40$).

2.3. Inclusion and exclusion criteria

Inclusion criteria were: (i) males or females aged 20–59 years; (ii) diagnosis and treatment by a psychiatrist for at least two years; (iii) no documented intellectual disability, such as learning disabilities or memory loss; (iv) living with a caregiver; (v) ability to read, write, or communicate in Thai; (vi) ability to use applications on a personal Android smartphone; and (vii) documented presence of at least one impaired life skill based on the six components of the Recovery Model [17]. Individuals receiving injectable psychiatric medication were excluded. Discontinuation criteria included: (i) participation in less than 20% of the eight-week intervention, as recorded in the app's usage database; (ii) unavailability for post-intervention follow-up; and (iii) relapse of severe mental symptoms that prevented further participation.

2.4. Intervention: participants received usual care in combination with the BUU True Friends application

2.4.1. BUU True Friends application

They were required to log in daily in response to scheduled notifications, follow the prompts within each functional module, engage in supplementary rehabilitation activities, and independently study the provided educational materials, adhering to the user manual. The process took approximately 30 min per day. Each day, participants and their caregivers assessed the success of the planned activities to reinforce motivation and progress toward set goals. On a weekly basis, the system calculated and reflected task success as a percentage to stimulate health behavior modification. Application

usage frequency and duration were continuously monitored through the platform database, which recorded user identification and session times. Additionally, caregivers assisted in supervising application use to ensure compliance and prevent unauthorized access.

2.5. Usual care: participants in the control group received standard psychiatric

Outpatient care, which included tailored psychoeducation focusing on personal hygiene, psychiatric medication adherence, and early detection of clinical warning symptoms. For individuals with a documented history of medication non-adherence or missed clinic appointments, continuity of care was supported through routine home visits conducted by community mental health nurses at least once every two to three months.

2.6. Data collection

Data collection was conducted by a trained research team consisting of two nurses between September and December 2025. In the pre-intervention phase (Week 0), baseline data for both groups and their primary caregivers were collected via Google Forms. For the control group, participants were added to a dedicated LINE communication group on their smartphones, with profiles hidden and direct messaging disabled to prevent cross-contamination. For the intervention group, participants received a web link to download and install the BUU True Friends mHealth application on their personal Android devices, along with a user manual and a standardized orientation session demonstrating each application function. At Week 8 (post-intervention), follow-up data were collected from both groups using the same baseline instruments via Google Forms. Additionally, the intervention group evaluated the usability and quality of the mHealth application and provided qualitative suggestions for future improvements.

2.7. Device and instruments

2.7.1. The BUU True Friends mHealth app

The BUU True Friend application was engineered through a systematic, five-phase process guided by the ADDIE Model for smartphone health applications [22].

2.7.1.1. Analysis. Baseline demands for digital support in medication management, structured routines, and relapse monitoring were identified

through stakeholder focus groups (psychiatrists, nurses, patients, caregivers) and a literature review.

2.7.1.2. Design. User interfaces and system structures were mapped by synthesizing.

Recovery-Oriented Model [10] psychiatric rehabilitation framework [17], Morelli et al.'s family support model [18], and evidence-based behavior modification principles (Table 1).

2.7.1.3. Development. Interactive wireframes and storyboards were translated into a functional application prototype in collaboration with software developers

2.7.1.4. Implementation. Content and systems underwent expert validation, followed by a pilot feasibility study within a subset of the target population.

2.7.1.5. Evaluation. Platform performance and user feedback from the pilot phase were analyzed to optimize the application prior to full-scale clinical trial deployment.

2.7.2. Pilot testing: accuracy, feasibility, and usability

Prior to the main trial, a two-stage pilot evaluation was conducted to ensure the application's accuracy, feasibility, and user-friendliness.

Expert Evaluation: An expert panel ($n = 5$, including psychiatric nursing executives and specialists) evaluated the application over a two-week period. The tool demonstrated high content accuracy, with Item-Objective Congruence (IOC) and Content Validity Indices (CVI) ranging from 0.90 to 1.00. Based on the Guidelines for Evaluating the Usability of mHealth Apps [23], usability scores ranged from 4.34 ($SD = 0.42$) to 4.68 ($SD = 0.54$) on a 5-point scale. Qualitative feedback from a subsequent focus group recommended adding automated emergency alerts for high-risk users, and the software was refined accordingly.

Patient Feasibility and Usability Testing: A 14-days pilot study was conducted with 40 chronic psychiatric patients distinct from the main trial sample. Guided by Bowen et al.'s feasibility framework [24], the application achieved a 100% retention rate with an average daily adherence duration of 14.62 min. Focus group discussions identified several user-friendliness barriers, including English-only medication entries, restricted daily activity options, and system instability during logging. Consequently, the application was re-engineered to allow Thai script inputs, customizable reminder windows, and editable entries. Post-trial evaluations via the mHealth App

Table 1. Application functional features, operational workflows, and theoretical rationales

Function & core focus	Operational workflow & social support role	Theoretical rationale & objective
F1: My information (Administrative)	• Nurses map the patient's residence via google maps. • The system stores essential patient and caregiver clinical data.	• Facilitates clinical tracking and rapid community outreach.
F2: My pillbox (self-care & Compliance)	• Patient and nurse setup prescribed regimens using an illustrated drug database. • Automated notification alarms trigger; patient confirms intake. • Caregiver cross-verifies daily compliance.	• Integrates psychiatric rehabilitation with caregiver appraisal support. • Objective: Maximize medication adherence and independent competence.
F3: Don't forget appointment (relapse Monitoring)	• App sends reminders 24 h before clinical visits. • Patient and caregiver concurrently log symptom checklists. • Data syncs to the nurse's dashboard.	• Evaluates perceptual consistency between patient and caregiver regarding symptoms. • Objective: Maintain follow-up and detect early warning signs.
F4: Daily activities (routine & Independence)	• Guided by nurse psychoeducation, patients schedule tasks across 6 daily slots (self-care, household, leisure). • Caregivers verify daily self-assessments.	• Restores structured daily living and time management skills. • Objective: Foster behavioral discipline and functional autonomy.
F5: Relieve stress (coping Strategies)	• App assesses stress via a structured questionnaire. • System delivers tailored coping mechanisms: Coping cues (normal), 4 relaxation exercises (mild–mod), or urgent nurse consulting links (high).	• Deploys emotion-focused coping and professional instrumental support. • Objective: Empower autonomous stress regulation.
F6: No more relapse (substance Cessation)	• Weekly, patients log substance cessation motivation and identify behavioral triggers. • Patient-nurse-caregiver triad builds and adjusts coping strategies.	• Integrates relapse prevention literature and collaborative social support. • Objective: Strengthen substance cessation and trigger management.
F7: Towards success (Visual Feedback)	• Aggregates longitudinal performance across F2, F4, F5, and F6 into simplified bar charts. • Issues monthly gamified scores and star points.	• Utilizes positive reinforcement and behavior modification loops. • Objective: Sustain long-term internal motivation.
F8: Star Trading game (community Skills)	• Patients engage in interactive game modules (Creative communication, household accounting, my community). • Monitored via a digital logbook for monthly nurse review.	• Re-establishes advanced financial, social, and vocational competencies. • Objective: Enhance successful community reintegration.
F9: No worries (health Literacy)	• Offers a central multimedia repository containing animated videos and clinical infographics.	• Rooted in self-directed learning principles. • Objective: Improve patient and family mental health literacy.

Usability Questionnaire (MAUQ) [25] indicated good overall satisfaction ($M = 30.90$, $SD = 6.78$) and quality ($M = 23.75$, $SD = 5.27$). Concurrently, clinic nurses rated the overall quality as good ($M = 4.15$, $SD = 0.14$), with high scores across usability ($M = 3.96$), efficiency ($M = 4.15$), and effectiveness ($M = 4.29$).

2.7.3. Research instruments and psychometric evaluation

The research instruments comprised validated questionnaires and clinical assessment scales administered via self-report or structured interviews by trained nurses and primary caregivers. To ensure content validity, six primary instruments underwent evaluation by a panel of three mental health and psychiatric experts, yielding an Item-Objective Congruence (IOC) index of 0.90–1.00.

Internal consistency was subsequently piloted among 40 individuals sharing identical clinical characteristics with the main trial sample. The resulting Cronbach's alpha reliability coefficients for the instruments ranged from 0.80 to 0.94, demonstrating high internal reliability.

2.7.4. Sociodemographic data questionnaire

A personal data questionnaire developed by the research team collected participants' sociodemographic information, including age, gender, education level, marital status, occupation, duration of mental health condition, number of hospitalizations, and relationship with caregivers.

2.7.5. Living skills assessment (LSA-30)

Developed by Boonyamalik et al. [26], the LSA-30 assesses caregivers' perceptions of the living skills of

the individuals in their care. The 30-item questionnaire covers six skill domains: self-care in daily activities; family coexistence; communication; living in the community; stress management; and earning a living/financial planning. Examples of items include: brushes own teeth or cleans own mouth every day; takes care of, or organizes, own bedding every time after waking up; and allocates time for daily recreation. Each item is rated on a 5-point scale, ranging from 0 (inability to perform independently) to 4 (ability to perform independently). Total scores are summed for each domain, then divided by 5, the number of items in each domain. Scores may range from 0 to 4 points, consisting of: level 1 (0–0.5 points: lack of ability to perform the activity); level 2 (0.51–1.5 points: able to perform the activity but does not do it); level 3 (1.51–2.5 points: able to perform it but always needs assistance); level 4 (2.51–3.5 points: able to perform it with some assistance); and level 5 (3.51–4.0 points: able to perform it independently). The IOC was 1.00, and Cronbach's alpha reliability coefficient was 0.92.

2.7.6. *The Thai mental health Indicator–15 (TMHI–15)*

Developed by Mongkol et al. [27], the TMHI–15 is a self-report questionnaire that asks respondents to reflect on their perceptions of mental well-being, based on their experiences over the past month. Example questions include: Do you feel comfortable? Do you feel disappointed in yourself? Do you have confidence in facing serious events that happen in your life? Each item is rated on a 4-point scale ranging from 0 (not at all) to 3 (mostly). Three items are reverse-scored. The scores range from 0 to 45 points. The scores were summed and compared using normative criteria, divided into three levels: better mental health than the general population (35–45 points), mental health equal to the general population (28–34 points), and lower mental health than the general population (≤ 27 points). The IOC was 1.00, and Cronbach's alpha reliability coefficient was 0.81.

2.7.7. *Medication adherence scale in thais (MAST)*

Developed by Suphachamroon et al. [28], the MAST is an 8-item self-report questionnaire for respondents to reflect on their medication adherence behavior over the past month. Example items include: How often do you forget to take your medication? How often do you stop taking your medication on your own? How often do you miss your full dose because you forget to take it or forget to take it during the day? What do you do if you travel a long distance and do not bring your

medication with you? Each item is rated on a 6-point scale. For items 1 to 6, response options are 1 (< once per month or never), 2 (1–2 times per month), 3 (3–5 times per month), 4 (6–9 times per month), 5 (10–15 times per month), and 6 (>15 times per month). For items 7 and 8, responses range from 1 (never) to 6 (very often). The summed scores range from 0 to 40 points; scores <34 indicate low medication adherence, and scores ≥ 34 indicate high medication adherence. The IOC was 1.00, and Cronbach's alpha reliability coefficient was 0.94.

2.7.8. *The brief psychiatric rating scale (BPRS)*

Developed by the Department of Mental Health [29], the 18-item BPRS is a standard departmental assessment of individuals and the severity of their psychiatric clinical symptoms, including anxiety, self-efficacy, and hallucinations. Nurses rate each item on a 7-point scale from 1 (no symptoms) to 7 (severe, requiring hospitalization). Summed scores may range from 18 to 126 points. Scores ≤ 36 points indicate mild psychotic symptoms; scores >36 points indicate severe psychotic symptoms.

2.8. *Social support questionnaire (SSQ)*

Developed by Rattana [30], the SSQ is a self-report instrument based on House's (1981) concept of social support to assess participants' perceptions of support received from their families in four support areas: (i) informational; (ii) appraisal; (iii) emotional and social; and (iv) instrumental. Example items include: The caregiver advising on how to behave when you are sick; The caregiver reminds you when you are irritated or stressed; You are confident that you will receive help from someone close to you if something bad happens to you. The 21-item scale rates responses with five options: 1 (least true) to 5 (most true). Higher scores indicate that the respondent receives more social support than those with a lower score. The IOC was 0.90, and the Cronbach's alpha reliability coefficient was 0.94.

2.8.1. *The mHealth app usability questionnaire (MAUQ)*

Developed by Hongsanun and Insuk [31], the MAUQ is a 38-item self-report questionnaire that asks users to evaluate their satisfaction with interacting with the mHealth app. The MAUQ comprises two domains: overall general quality (29 items) and user risk (9 items). For general quality, users evaluate the app's ease of use, usability, aesthetics, connectivity, functionality, information, user satisfaction, acceptability, motivation, engagement, and data management. For user risk, the

evaluation covers the app's credentials, error occurrence, security, privacy, and undesirable events. The app includes a menu with tutorials and references to medical research papers. The rating scale is dichotomous: 1 (Yes) and 0 (No or Unsure). The summed score may range from 0 to 38 points. Higher scores indicate a higher evaluation of the app. The IOC was 0.90, and Cronbach's alpha reliability coefficient was 0.80.

2.9. Data analysis

Descriptive statistics, including frequencies, percentages, means, and standard deviations (SD), were used to summarize baseline characteristics and clinical outcomes. For within-group (pretest-to-posttest) changes, parametric variables were analyzed using paired-sample t-tests, while non-parametric variables violating normality assumptions were evaluated using the Wilcoxon signed-rank test.

For between-group post-intervention comparisons, Analysis of Covariance (ANCOVA) was performed. Baseline gender, educational level, and the respective pretest scores were entered as fixed factors or covariates to control for confounding effects, reporting adjusted means, 95% confidence intervals (CI), and partial eta squared (η^2p) as the effect size indicator. Statistical significance was set at $p < 0.05$. All statistical analyses were conducted using IBM SPSS version 29.0.

2.10. Ethical statement

This Institutional Review Board of Burapha University, Thailand, approved the research project (Code IRB1-109/2568). This study was also registered with the Thai Clinical Trial registration (Code TCTR20250921001). An application was copyrighted by the Department of Intellectual Property (DIP) on 4 September 2025. Individuals who voluntarily participated in the study were informed about the study objectives and data collection procedures. Participants could refuse to participate or withdraw from the study at any time without affecting their care. All data were kept confidential by assigning a unique code to each participant. Access to the app was protected by username and password.

3. Results

3.1. Baseline characteristics of the participants

As shown in Table 2, the baseline demographic and clinical characteristics were homogenous between the intervention and control groups across

most variables, including age, marital status, occupation, duration of illness, history of hospitalization, and relationship with caregivers ($p > 0.05$). The participants had a mean age of 40–41 years. Since the duration of illness and the history of hospitalization were non-normally distributed, they were analyzed using the Mann–Whitney U test, revealing a median illness duration of 4.00–5.00 years and a median of 2.00 prior hospitalizations for both groups. The majority of participants in both groups were single, employed, and primarily cared for by a spouse, partner, or friend.

However, significant baseline discrepancies were observed between the two groups regarding gender ($p = 0.014$) and educational level ($p = 0.011$). The intervention group had a higher proportion of female participants (60.0%), whereas the control group was predominantly male (67.5%). In terms of education, a higher percentage of participants in the intervention group held a bachelor's degree (25.0%) compared to the control group (17.5%). Consequently, these two variables were statistically controlled as fixed factors in the subsequent primary outcome analyses.

3.2. Effects of the BUU True Friends application on primary outcomes

Table 3 presents the within-group longitudinal changes from baseline to post-intervention and the between-group comparisons controlled for baseline covariates.

Regarding within-group changes from pretest to posttest, the intervention group demonstrated statistically significant improvements across multiple domains of the Living Skills Assessment (LSA-30), specifically within self-care ($p = 0.016$), family functioning ($p = 0.032$), and relaxation skills ($p = 0.001$). Furthermore, participants in the intervention group achieved significant gains in overall psychological well-being (TMHI-15, $p = 0.050$) and medication adherence (MAST, $p = 0.009$). Conversely, the control group exhibited a significant longitudinal decline in psychological well-being over the study period (TMHI-15, $p = 0.002$) and a significant exacerbation of psychiatric symptom severity (BPRS, $p = 0.012$).

For between-group post-intervention comparisons, Analysis of Covariance (ANCOVA) was performed. After statistically controlling for baseline gender, educational level, and the respective pretest scores, the intervention group demonstrated significantly superior adjusted mean scores in several psychiatric rehabilitation life skills domains compared to the control group. Significant therapeutic benefits were observed in the self-care domain

Table 2. Characteristics of individuals with chronic mental health conditions

Characteristics	Intervention group		Control group		Statistical value/U	p-value
	(n = 40)		(n = 40)			
	n	%	n	%		
Gender						
Male	16	40	27	67.5	6.084 ^a	0.014*
Female	24	60	13	32.5		
Age (years)						
Mean (SD)	40.75 (11.11)		41.38 (7.82)		−0.291 ^b	0.772
Educational level						
No formal education	9	22.5	8	20	14.784 ^a	0.011*
Primary	4	10.0	5	12.5		
Secondary	15	37.5	16	40		
Vocational	2	5.0	4	10		
Bachelor's degree	10	25	7	17.5		
Marital status						
Single	26	65.0	27	67.5	0.056 ^a	0.813
Married	14	35.0	13	32.5		
Occupation						
Employed	23	57.5	21	52.5	0.202 ^a	0.653
Unemployed	17	42.5	19	47.5		
Duration of illness (years)						
Mean (SD)	5.93 ± 5.85,5.00 (5)		6.03 ± 4.67,4.00 (6)		766.50 ^c	0.746
History of hospitalization (time)						
Mean (SD)	2.18 ± 1.41,2.00 (2)		2.23 ± 1.35,2.00 (2)		779.50 ^c	0.836
Relationship with caregiver						
Parents	6	15.0	8	20.0	1.291 ^a	0.863
Sibling	6	15.0	5	12.5		
Relative or child	8	20.0	6	15.0		
Husband or wife	9	22.5	12	30.0		
Friend or partner	11	27.5	9	22.5		

Note: ^a Chi-square test; ^b Independent t-test (normality verified via Shapiro–Wilk test); ^c Mann–Whitney U test, *p < 0.05).

($F = 10.224$, $p = 0.002$, $\eta_p^2 = 0.144$), family domain ($F = 6.239$, $p = 0.015$, $\eta_p^2 = 0.093$), relaxation domain ($F = 5.318$, $p = 0.025$, $\eta_p^2 = 0.080$), and community living domain ($F = 4.333$, $p = 0.042$, $\eta_p^2 = 0.066$).

Furthermore, the ANCOVA model revealed substantial practical significance for primary clinical outcomes. The intervention group achieved a significantly better adjusted mean for psychological well-being ($F = 11.383$, $p = 0.001$, $\eta_p^2 = 0.157$). The intervention group also successfully maintained clinical symptom stability, whereas the control group's psychiatric symptoms significantly worsened, resulting in a statistically significant between-group difference in symptom severity at posttest ($F = 10.509$, $p = 0.002$, $\eta_p^2 = 0.147$). No significant between-group adjusted differences were observed for the communication domain, occupational domain, medication adherence, or perceived social support ($p > 0.05$).

3.3. Usability and satisfaction of the mHealth application

Post-intervention usability evaluations via the mHealth App Usability Questionnaire (MAUQ)

demonstrated high user satisfaction and acceptability among participants in the intervention group ($n = 40$). As presented in Table 4, the overall usability score reached an average of 30.90 ($SD = 6.78$) out of a maximum possible score of 38. For specific dimensions, the participants rated the general quality domain at a high mean score of 23.75 ($SD = 5.27$, possible range: 0–29) and the user risk domain at 7.15 ($SD = 2.20$, possible range: 0–9), indicating that the BUU True Friends application was perceived as highly stable, secure, and user-friendly for community-dwelling individuals with chronic mental health conditions.

4. Discussion

Following the eight-week intervention using the BUU True Friends mHealth application, the intervention group demonstrated significant within-group longitudinal improvements in self-care, family coexistence, relaxation skills, overall psychological well-being, and medication adherence. More importantly, after statistically adjusting for baseline discrepancies (gender and educational

Table 3. Within-group longitudinal changes and between-group post-intervention comparisons of primary outcomes (N = 80).

Variable/Outcome domains	Group	Pretest M (SD)	Posttest M (SD)	Within-group statistic (p-value)	Posttest Adjusted M (95% CI)	Between-group ANCOVA		
						F	p-value	Effect size
LSA-30 (living Skills)								
(1) Self-care domain	Intervention	3.54 (0.70)	3.87 (0.32)	−2.415 ^d (0.016*)	4.07 (3.80, 4.34)	10.224	0.002*	0.144
	Control	3.63 (0.72)	3.38 (1.04)	−2.723 ^d (0.006*)	3.46 (3.20, 3.72)			
(2) Family domain	Intervention	3.47 (0.58)	3.73 (0.44)	−2.151 ^d (0.032*)	3.81 (3.55, 4.07)	6.239	0.015*	0.093
	Control	3.46 (0.78)	3.29 (0.96)	−1.353 ^d (0.176)	3.35 (3.09, 3.61)			
(3) Communication domain	Intervention	3.82 (0.42)	3.84 (0.33)	−0.345 ^d (0.730)	3.82 (3.67, 3.97)	1.682	0.200	0.027
	Control	3.75 (0.37)	3.64 (0.54)	−1.570 ^d (0.116)	3.68 (3.53, 3.83)			
(4) Community domain	Intervention	3.55 (0.52)	3.75 (0.51)	−1.907 ^d (0.057)	3.74 (3.55, 3.93)	4.333	0.042*	0.066
	Control	3.47 (0.66)	3.40 (0.71)	−1.147 ^d (0.251)	3.46 (3.28, 3.65)			
(5) Relaxation domain	Intervention	2.93 (0.95)	3.51 (0.59)	3.485 ^c (0.001**)	3.60 (3.36, 3.84)	5.318	0.025*	0.080
	Control	2.99 (1.00)	3.26 (0.68)	1.346 ^c (0.180)	3.21 (2.97, 3.45)			
(6) Occupational domain	Intervention	3.27 (0.96)	3.34 (0.83)	−0.375 ^d (0.708)	3.33 (3.15, 3.51)	0.326	0.570	0.005
	Control	3.23 (0.53)	3.26 (0.60)	−0.921 ^d (0.357)	3.26 (3.07, 3.44)			
TMHI-15 (mental Well-being)	Intervention	43.50 (7.43)	46.10 (8.05)	2.022 ^c (0.050*)	46.38 (43.78, 48.98)	11.383	0.001**	0.157
	Control	42.38 (7.61)	39.93 (8.50)	3.288 ^c (0.002*)	40.17 (37.58, 42.75)			
MAST (medication Adherence)	Intervention	33.80 (6.03)	35.10 (6.96)	2.624 ^d (0.009*)	37.63 (35.27, 39.99)	2.325	0.132	0.037
	Control	34.07 (6.57)	36.98 (4.35)	−0.745 ^d (0.456)	35.09 (32.74, 37.44)			
BPRS (symptom Severity)	Intervention	34.18 (18.27)	32.53 (10.58)	−0.141 ^d (0.888)	30.79 (24.62, 36.95)	10.509	0.002*	0.147
	Control	32.53 (10.58)	42.50 (20.52)	−2.514 ^d (0.012*)	44.90 (38.76, 51.04)			
SSQ (social Support)	Intervention	76.25 (21.39)	79.63 (19.16)	1.083 ^c (0.285)	81.03 (75.28, 86.79)	1.817	0.183	0.029
	Control	77.28 (19.12)	76.20 (16.75)	−0.512 ^c (0.612)	75.57 (69.86, 81.28)			

Note: M = Mean, SD=Standard Deviation, CI=Confidence Interval, η_p^2 = Partial Eta Squared. Within-group analysis was verified using ^c Paired-sample t-test or ^d Wilcoxon signed-ranks test based on data normality. Between-group posttest analysis was performed using Analysis of Covariance (ANCOVA) by entering baseline gender, educational level as fixed factors, and corresponding pretest scores as covariates. *p < 0.05, **< 0.001.

Table 4. The mean score of MAUQ ($n = 40$).

Variable	Possible range	Mean	SD
The mHealth app usability questionnaire (MAUQ)			
(1) General quality domain	0–29	23.75	5.266
(2) User risk domain	0–9	7.15	2.202
Overall usability	0–38	30.90	6.781

level) via ANCOVA, between-group comparisons revealed that the intervention group achieved significantly higher post-intervention scores in self-care, family coexistence, relaxation skills, community living, and psychological well-being compared to the control group.

These findings underscore the capacity of digital health interventions to foster psychiatric rehabilitation by nurturing personal responsibility and structure in daily routines. Through the app's embedded scheduling and activity-tracking features, participants were empowered to actively plan and track their rehabilitation tasks. This digital framework fostered a sense of self-control and heightened self-worth, which was qualitatively supported by participants who noted that progress visualizers and reminders motivated them to achieve their behavioral goals. This aligns with global literature, including a systematic review by Masfi et al. [32] and international consensus reports on digital psychiatry, which emphasize that integrating mHealth into psychiatric care offers continuous behavioral monitoring and reinforcement that standard, episodic outpatient care cannot provide [33]. Worldwide, mobile tools have increasingly been recognized as effective vehicles for continuous self-management in chronic conditions, bridging the gap between clinical consultations and community-based living [13].

The observed improvements in relaxation skills and psychological well-being further validate the clinical utility of the app's targeted stress management component. Individuals with chronic psychiatric conditions frequently rely on maladaptive defense mechanisms such as avoidance, denial, or substance use to mitigate distress [34]. By providing an objective, real-time stress assessment feature, the application prompted participants to cultivate acute self-awareness of their emotional states. The subsequent layer of severity-specific relaxation techniques offered immediate, practical strategies to alleviate tension, as illustrated by qualitative reflections where participants noted the app helped them maintain “mindfulness in solving problems.” These results complement global findings, such as studies on the “Be Aware of Stress” application by

Hengudomsub et al. [35] and broader Western trials of mobile cognitive behavioral therapy (mCBT) tools, which indicate that localized, symptom-specific mobile feedback significantly dampens perceived stress and prevents the accumulation of psychiatric morbidity [36].

Regarding medication adherence, the application addressed a critical barrier faced by working-age individuals—unintentional non-adherence driven by busy occupational schedules and memory lapses. The app's medication reminder system served as an external cognitive aid, transforming adherence from a reactive struggle into a structured routine. This outcome is consistent with regional findings by Sudjai et al. [37] and international meta-analyses examining mHealth adherence tools in Western and Asian psychiatric cohorts, which universally conclude that digital alerts significantly reduce missed doses and sustain long-term treatment compliance in the community [38].

A pivotal finding of this study was the significant between-group difference in community living skills, despite non-significant differences within the specific communication domain. The app utilized interactive tasks and caregiver-facilitated challenges (e.g., community shopping or public exercises) to actively pull participants out of social isolation. By positioning the caregiver as a social facilitator, the intervention successfully translated application-based tasks into real-world social participation. This empirical success resonates with global psychiatric rehabilitation paradigms that emphasize social inclusion and caregiver scaffolding as foundational pillars for restoring social functioning and reducing the stigma-induced alienation often experienced by individuals with chronic mental illnesses [18,39].

However, scholarly balance requires a critical reflection on the non-significant outcomes observed in communication skills, occupational skills, and perceived social support (SSQ). While the lack of baseline communication deficits—given the participants' preserved cognitive functions—partially explains the stable communication scores, alternative explanations must be considered. Specifically, professional communication and occupational functioning (e.g., job performance and financial planning) represent highly complex, macro-level behavioral shifts. The eight-week intervention duration may have been insufficient to yield measurable changes in these structural domains, as occupational reintegration typically requires long-term vocational rehabilitation and multi-sectoral support beyond an autonomous mobile tool. Furthermore, the non-significant between-group difference in perceived social

support can be attributed to the study's inclusion criteria, which required all participants in both arms to have an active primary caregiver from the outset [10]. Consequently, both groups benefited from high baseline levels of familial support, creating a ceiling effect that masked potential intervention-driven enhancements.

Nevertheless, the significant between-group post-test discrepancy in psychiatric symptom severity (BPRS) underscores the robust protective value of the mHealth tool. The ANCOVA model revealed that the intervention group successfully maintained symptom stability, whereas the control group experienced a significant escalation in psychiatric symptoms—particularly in anxiety and tension—over the study period. Without digital stress management and adherence scaffolding, the control group remained vulnerable to the cumulative effects of community stressors, leading to symptom exacerbation. This critical divergence is well-supported by global systematic evidence from Almuqrin et al. [40], which affirms that a lack of structured community coping mechanisms directly correlates with elevated relapse risks and symptom recurrence.

Finally, the overall success and high usability scores (Table 4) confirm the feasibility of executing stakeholder-driven digital nursing interventions. Utilizing the ADDIE model [22] to co-design the application with psychiatrists, community nurses, patients, and caregivers ensured that the software architecture directly resolved user-specific challenges. This collaborative approach mirrors international software development best practices in digital health, proving that user-centered design is imperative for maximizing engagement, satisfying safety credentials, and ensuring the long-term viability of mHealth applications within community mental health systems [35,36].

4.1. Limitations

Several methodological limitations should be acknowledged when interpreting the findings of this study. First, participant recruitment was conducted at a single outpatient service site in Eastern Thailand, which may limit the generalizability of the findings to other geographical regions or clinical settings with different socioeconomic characteristics. Second, the BUU True Friends mHealth application was exclusively operational on the Android platform, thereby excluding individuals utilizing alternative mobile operating systems (e.g., iOS). Third, participation was constrained by digital literacy and technology accessibility requirements, meaning the intervention may not be immediately

generalizable to patients with lower technological competency or limited smartphone access. Furthermore, despite utilizing Analysis of Covariance (ANCOVA) to statistically control for the significant baseline differences in gender and educational level, the potential residual confounding effects of these baseline discrepancies cannot be entirely eliminated. Finally, while this digital intervention effectively supports rehabilitation, it serves as a supplementary tool rather than a replacement for comprehensive multidisciplinary care. The study relied on self-reports and caregiver collaboration, and using the application alone could not independently verify absolute clinical adherence without direct professional monitoring.

5. Conclusion

The findings suggest that the BUU True Friends mHealth application demonstrates encouraging feasibility and preliminary effectiveness as a supplementary digital nursing tool to support psychiatric rehabilitation and clinical stability among community-dwelling individuals with chronic mental health conditions. While these initial results are promising, interpretation should be approached with caution given the specific sample size and single-site context.

6. Relevance for Clinical Practice, Education, and Management

In clinical practice, this mHealth application offers a potential adjunctive tool within the community nursing service system to support patient self-care and reinforce treatment adherence. Rather than replacing standard care, it provides a structured platform to facilitate remote monitoring and encourage positive health behaviors. Future research should integrate advanced digital capabilities—such as artificial intelligence for initial screening or real-time teleconferencing—and validate these preliminary findings across larger, multi-center cohorts to evaluate long-term behavioral sustainability.

Furthermore, within nursing education and management, the application serves as a practical model for introducing digital health innovations. It provides nursing students with a tangible tool for community-based psychiatric care and demonstrates how technological integration can align with national mental health policies aimed at enhancing equitable service accessibility. From a management perspective, this digital framework can assist nursing administrators in optimizing community resource allocation and

designing structured, technology-driven protocols for remote psychiatric care delivery.

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Data availability statement

The data set generated during and analyzed during the current study is available from the corresponding author upon reasonable request.

Declaration of Generative AI and AI- Assisted Technologies

The authors declare that no generative AI or AI-assisted technologies were used in the writing or preparation of this manuscript.

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Conflict of interest

The authors declare no actual or potential conflicts of interest.

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