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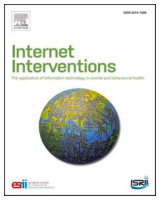

A mobile-based, single-session intervention to empower parents of adolescents hospitalised for non-suicidal self-injury: A mixed-methods randomised controlled trial

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ABSTRACT

Background: Adolescents hospitalised for non-suicidal self-injury (NSSI) represent a particularly severe subset within psychiatric care. The NSSI imposes significant challenges on parents, including lack of knowledge, ineffective coping strategies, and negative emotions, exacerbated by stigma. Parental empowerment is crucial for supporting adolescent recovery; however, current interventions often neglect parents. Single-session interventions (SSIs) may offer an accessible and promising approach to address this gap.

Methods: This mixed-methods study assessed the short-term effects of project CSH-P: a mobile-based, self-guided SSI aimed at empowering parents of adolescents hospitalised for NSSI. 88 participants were randomly assigned to CSH-P (n = 46) or control group (n = 42). Online assessments measuring knowledge, attitudes, and stigma were administered at baseline, immediately post-intervention, and one week later. Additionally, semi-structured individual interviews were conducted with participants who received CSH-P post-intervention.

Results: Compared to the control group, participants who received CSH-P showed significant improvements in NSSI-related knowledge (Cohen's d = .42, p = .027) and more positive attitudes toward their adolescents (Cohen's d = - .31, p = .047). Qualitative findings confirmed these results, with parents reporting highly positive engagement and perceived empowerment across cognitive, emotional, and behavioural dimensions. Furthermore, parents provided constructive feedback for further enhancing the intervention's impact.

Conclusions: Project CSH-P demonstrates the potential to enhance parental empowerment in managing adolescent self-injurious behaviours. Its brevity, low cost, and ease of dissemination make it a promising strategy for widely applicable prevention and treatment efforts. Future research should explore the long-term sustainability of these improvements and assess the broader impact on parenting practices and adolescent treatment outcomes.

1. Introduction

Non-suicidal self-injury (NSSI) refers to intentional self-inflicted damage to one's own body tissue without suicidal intent (Butler and Malone, 2013). Adolescent NSSI presents a critical concern in psychiatric care, particularly in inpatient settings where cases tend to be more severe. While approximately 22 % of adolescents in nonclinical populations report engaging in NSSI at least once (Lim et al., 2019), the prevalence among hospitalised adolescents is significantly higher, ranging from 51.5 % to 78.3 %, depending on comorbid psychiatric diagnoses (Sun et al., 2023; Wang et al., 2021; Zhong et al., 2024). Adolescents hospitalised for NSSI are vulnerable to recurring episodes of

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self-injury and suicide attempts, particularly in the initial weeks following psychiatric admission (Daukantaitė et al., 2021; de Neve-Enthoven et al., 2024; Stewart et al., 2018).

NSSI not only affects the individuals who engage in it but also presents significant challenges for their parents(Whitlock et al., 2018). Parents often face acute stress and a sense of crisis when their child's behaviour necessitates hospitalisation (Ferrey et al., 2015; Fu et al., 2020; Victor et al., 2019). A primary challenge is the lack of knowledge about NSSI, leading to confusion and misconceptions (Fu et al., 2020; Wang et al., 2022). This, coupled with ineffective coping strategies, can leave parents feeling disempowered and unable to adequately support their children (Whitlock et al., 2018). Additionally, managing care for a child who self-injures can also result in 'secondary stress,' characterised by negative emotions and attitudes (e.g., guilt, shame, or judgment) toward the child or even oneself (Waals et al., 2018). Additionally, many parents also experience social isolation from family, friends and support networks due to stigma, fear of judgment, or difficulty discussing their child's behaviour (Chiang et al., 2015; French et al., 2024; Musetti et al., 2021; Townsend et al., 2022). Isolation can be exacerbated by adolescents who actively resist parental involvement, further complicating communication and emotional support within families (Musetti et al., 2021).

Parents, as primary caregivers, play a crucial role in managing adolescent self-injurious behaviour and facilitating recovery (Qin et al., 2023). However, current interventions largely prioritise adolescents, leaving parents with limited resources to navigate this challenging experience (French et al., 2024; Morgan et al., 2013). Parental empowerment—the process through which parents enhance their control over decisions and actions that affect their child's health—has been shown to improve treatment outcomes for adolescents (Ashcraft et al., 2019). Empowered parents are more likely to engage effectively in their child's care, positively influencing the recovery process (Damen et al., 2021). Zimmerman's Psychological Empowerment Theory, expanded by Christens and Peterson, offers a framework for promoting empowerment across cognitive, emotional, and behavioural dimensions (Christens and Peterson, 2012; Perkins and Zimmerman, 1995). Cognitive empowerment is achieved by increasing parents' knowledge and awareness of NSSI through psychoeducational modules that deliver evidence-based information about common triggers and underlying psychological mechanisms (Ashcraft et al., 2019; Sophie et al., 2018; Sun et al., 2014; Wang et al., 2022). Emotional empowerment focuses on self-efficacy, resilience, and confidence, which are shaped by parental attitudes toward themselves and their child (Ashcraft et al., 2019; Strahan et al., 2017; Vuorenmaa et al., 2016). To foster positive attitudinal change, the intervention incorporates self-compassion techniques, enabling parents to challenge maladaptive beliefs, reduce self-blame, and adopt more supportive perspectives (Lathren et al., 2020; Sirois et al., 2019). Behavioural empowerment involves applying acquired knowledge and coping strategies in real-life interactions with adolescents, such as guiding adolescents toward healthier coping mechanisms and developing effective communication skills (Ashcraft et al., 2019; French et al., 2024; Zhao et al., 2023). These strategies equip parents with practical tools to actively engage in their adolescent's recovery process and foster a more supportive family environment. Given these advantages, understanding how parents experience and benefit from empowerment-based interventions is essential, highlighting the importance of exploring their perspectives through both quantitative and qualitative methods.

In-person mental health interventions for parents face several barriers, such as limited availability, time constraints, financial costs, and concerns about privacy or stigma (Branjerdporn et al., 2023; Mytton et al., 2014; Radez et al., 2021). Digital interventions, particularly mobile-based interventions, offer a scalable and accessible alternative. A meta-analysis by Linardon et al. (2019) provided robust evidence supporting the effectiveness of smartphone interventions in reducing mental health problems across diverse populations, reinforcing their potential in delivering psychological support. Mobile-based single-session interventions (SSIs) further address these barriers by delivering concise, evidence-based content in a flexible format (Schleider and Weisz, 2017). SSIs have demonstrated effectiveness in improving parenting practices and treatment outcomes for children (Cardamone-Breen et al., 2018; Korpilahti-Leino et al., 2022; Sung et al., 2021). Given their proven accessibility and efficacy, mobile-based SSIs present a promising approach to addressing the unmet support needs of parents whose adolescents engage in NSSI.

To this end, this study aims to address the gap by developing and testing a mobile-based self-guided SSI for parents—project CSH-P—to provide psychoeducation and teach coping strategies to empower parents of adolescents receiving inpatient treatment for NSSI. Using a mixed-methods design, this study quantitatively assessed the intervention's immediate impact on parents' knowledge, attitudes, and stigma related to NSSI, while qualitatively exploring their engagement experiences, perceived empowerment, and suggestions for improvement. The insights gained from this research will guide future implementation and enhancement of parent-focused, empowerment-based interventions within clinical settings.

2. Methods

2.1. Study design and ethics

This mixed-methods research incorporated a randomised controlled trial alongside a descriptive qualitative study. This study received ethical approval from the Ethics Review Committee for Nursing and Behavioural Medicine Research, Xiangya Nursing School, Central South University (E2023123). This study was performed in accordance with CONSORT reporting guidelines (Schulz et al., 2010) and retrospectively registered with the Chinese Clinical Trial Registry (ChiCTR2400087236). This study was initially conceptualised as a quality improvement (QI) initiative focused on enhancing the accessibility and implementation of digital psychoeducational resources within inpatient settings. As the research progressed, the broader scientific implications became evident, prompting formal registration as a clinical trial. Administrative delays in registration led to retrospective registration; however, no modifications were made to the study's original objectives, intervention protocol, or primary outcome measures. Therefore, retrospective registration did not influence the integrity or interpretation of the study results.

2.2. Recruitment, eligibility criteria, and sample size

Participants were recruited from the child and adolescent psychiatric ward of a tertiary hospital in China between June 2023 and February 2024, after their child completed the admission assessment. To be eligible, parents needed to have a biological child aged 10 to 19 years who was hospitalised for psychiatric disorders with a history of NSSI within the past 12 months, be present with their child in the ward, and be literate and proficient in using WeChat. Parents with severe physical or mental health conditions that could impair their ability to participate were excluded from the study. All participants, including both parents and adolescents, provided informed consent prior to enrolment.

The sample size was determined using G*Power (3.1.9.7) based on the following parameters: a repeated-measures ANOVA with within-between interactions, an effect of 0.25, a statistical power of 95 %, and an alpha level of 5 %. The calculation also accounted for three measurement points—baseline, post-intervention, and follow-up—along with a correlation of 0.5 between the repeated measures. These criteria indicated that a total of 44 participants (22 per group) were needed. To account for potential attrition rates reported in previous online intervention studies (10 %–50 %), the minimum sample size was increased to 32 participants per group, allowing for a 30 % attrition rate (Feng et al., 2022).

2.3. Procedure

At baseline, parents were instructed to register on *Deep Space*, a WeChat mini-programme developed by the research team. Registration involved adding the programme as a contact and scanning a WeChat QR code for access. Once registered, parents were randomly assigned in a 1:1 ratio to either the intervention or control group using an unblocked, unstratified randomisation procedure generated by *Deep Space*. After randomisation, participants completed the baseline assessment online, guided by prompts from the platform.

Upon completing the baseline assessment, parents in the intervention group were immediately granted access to Project CSH-P, a 5–6 min, self-guided SSI delivered in video format and designed to empower parents to manage their child's NSSI issues. CSH-P was adapted from the English-language brochure 'Coping with Self-Harm: A Guide for Parents and Carers,' originally developed by the Centre for Suicide Research at the University of Oxford (Ferrey et al., 2015). To create CSH-P, the brochure was first translated into Chinese and converted into a PowerPoint slideshow (version 16.0, Microsoft) with embedded animations. This presentation was then converted into a video using Final Cut Pro (version 10.6.6), with a clinician providing synchronised narration in Chinese. Background music was added to enhance viewer engagement and maintain focus (Xu et al., 2023). Table 1 summarises the structure and content of CSH-P, aligning each topic with a dimension of Zimmerman's Psychological Empowerment Theory. Specifically, Topic 1 promotes cognitive empowerment by delivering evidence-based information about NSSI, including definitions, risk factors, underlying causes, and consequences. Topic 2 fosters behavioural empowerment by introducing action-oriented strategies, such as communication skills development, injury management, and alternative coping mechanisms. Topic 3 enhances emotional empowerment, emphasizing self-care, stress management, and access to support networks.

Parents in the control group received a neutral psychoeducational video that matched the intervention video in terms of visual presentation, digital delivery platform, and duration. The control video provided general health information on common flu prevention, entirely unrelated to mental health or adolescent NSSI. As the video was originally developed in Chinese, no translation was necessary, ensuring consistency in language across both study groups. The video was delivered via the same WeChat mini-programme as used for the intervention, ensuring that both groups received equivalent digital exposure. This design corresponds to the 'Placebo-Minimal' control condition as defined in Goldberg et al.'s typology, allowing us to isolate the intervention's specific effects related to targeted NSSI-focused content (Goldberg et al., 2023).

Regardless of the assigned condition, all parents were asked to complete questionnaires immediately after the intervention and again one week later during a follow-up assessment. Additionally, parents in the intervention group were invited to participate in semi-structured, individual interviews following the post-intervention assessment. The control group parents were informed that they would receive delayed access to Project CSH-P after the study period. Throughout the study, all participants continued to receive routine care from medical staff in the inpatient ward.

Table 1
Overview of CSH-P.

#	Topics	Content
1	Understanding adolescent self-injury	• What is self-injury? • Risk factors contributing to adolescent self-injury, including individual, family, and social factors; • Underlying causes of adolescent self-injury; • Significant consequences associated with adolescent self-injury.
2	Managing adolescent self-injury	• Developing open and effective communication skills; • Approaches to managing injuries following adolescent self-injury; • Alternative strategies for self-injury, such as relaxation, distraction techniques, emotional expression, and physical alternatives.
3	Parental self-care	• Listening to your own needs; • Managing the stress associated with caregiving responsibilities; • Promoting positive thinking to reawaken hope; • Accessing professional and social support networks.

Notes: Using 'self-injury' in the intervention material aimed to improve readability and relatability, ensuring that parents could understand and engage with the content without requiring prior knowledge of psychiatric terminology.

2.4. Quantitative measures

2.4.1. Demographics

The research team utilised a self-designed questionnaire to collect information on parents' demographic characteristics, including age, sex, marital status, education level, economic status, and type of residence. Demographic and clinical characteristics data for the adolescents engaging in NSSI, including age, sex, psychiatric diagnosis, history of suicidal ideation, and suicide attempts, were gathered from the medical record system. Instances of NSSI were identified through clinical data recorded by psychiatrists during the initial admission assessment. The frequency of NSSI episodes was collapsed into four categories (1, 2–10, 11–50, and $>$ 50 episodes), following the categorization by de Neve-Enthoven et al. (2024).

2.4.2. Outcome measures

Quantitative outcome measures assessed cognitive and emotional empowerment. Cognitive empowerment was evaluated through knowledge acquisition (primary outcome), whereas emotional empowerment was assessed based on changes in attitudes and stigma (secondary outcomes).

2.4.2.1. Cognitive empowerment: knowledge acquisition. A 14-item questionnaire was utilised to assess parental knowledge about NSSI, which was originally developed by Bond et al. (2019) and subsequently validated in its Chinese version by Chen (2023). Each question allowed participants to respond with "true," "false," or "I don't know." Responses were scored by assigning 1 point for each correct answer and 0 points for incorrect answers or "I don't know" responses. The total knowledge score was derived by summing the scores across all 14 questions, yielding a possible range of 0 to 14, with higher scores indicating greater knowledge. The Cronbach's α coefficient in the study was 0.76, indicating good reliability.

2.4.2.2. Emotional empowerment: attitudes and stigma. Parental attitudes toward adolescents engaging in NSSI were assessed using the Chinese version of the Self-Harm Antipathy Scale (SHAS), originally developed by Patterson et al. (2007) and validated in Chinese populations by Peng (2023). The SHAS contains 21 items across six dimensions: ability assessment, patient intention processing, helping cognition, ineffective care, demand function, and aversion to self-harm. Each item is rated on a 7-point Likert scale, with total scores ranging from 21 to 147. Higher scores on the SHAS reflect more negative parental attitudes toward adolescents who engage in NSSI. In this study, the Cronbach's α coefficient was found to be 0.72.

The Affiliate Stigma Scale (ASS; 22-item) was used to measure self-stigma felt by parents of adolescents with NSSI, including affective, cognitive, and behavioural dimensions (Mak and Cheung, 2010). Originally developed in Hong Kong, China, the ASS was later translated into Mandarin Chinese and validated in mainland Chinese populations, confirming its reliability and validity (Qiu et al., 2023; Shi et al., 2019;

Wang et al., 2024). Participants rate each item using a 4-point Likert scale, from 1 (strongly disagree) to 4 (strongly agree). The total scores of the ASS range from 22 to 88, with higher scores indicating greater levels of self-stigma. In this study, the ASS demonstrated excellent reliability, with a Cronbach's α coefficient of 0.93.

2.5. Qualitative interviews

At post-intervention, the first author and a research assistant conducted in-person, individual, semi-structured interviews with parents who received CSH-P. Both interviewers had undergone training in qualitative research methods to ensure the interviews were conducted appropriately. Each interview lasted 15 to 45 min, was audio-recorded, and was accompanied by field notes, with participants' consent. Interviews took place in a private psychological interview room within the hospital ward.

The interviews explored parents' experiences and perceptions of CSH-P, focusing on its perceived effects on cognitive, emotional, and behavioural empowerment. As the interviews were conducted immediately post-intervention, behavioural empowerment was assessed through participants' stated intentions and perceived readiness to implement NSSI management strategies rather than through observed behavioural changes over time.

A semi-structured interview guide (please see supplementary material 1) was developed using a theory-driven, evidence-based approach. The guide was grounded in Zimmerman's Psychological Empowerment Theory, examining how the intervention influenced cognitive, emotional, and behavioural empowerment in parents (Perkins and Zimmerman, 1995). Additionally, a review of existing literature on parental experiences with self-injurious adolescents, parental needs, and barriers to engagement in NSSI-related programmes informed the inclusion of questions on programmes usability, acceptability, and areas for improvement (Chiang et al., 2015; Fu et al., 2020; Krysinska et al., 2020; Stewart et al., 2018). To ensure content validity and relevance, the initial draft was reviewed by clinical psychiatrists, psychologists, and digital health researchers, whose feedback guided refinements to the interview questions.

2.6. Data analysis

2.6.1. Quantitative analysis

Quantitative data were analysed in SPSS version 27, adhering to the intention-to-treat (ITT) principle. To handle missing data resulting from participant attrition, we employed the Last Observation Carried Forward (LOCF) method, which carries forward the last available observation to subsequent missing assessments. Participants' characteristics were calculated using descriptive statistics. To assess changes between the two groups over time, adjusted generalised estimating equations (GEE) were employed, accounting for repeated measures across the three time points and using baseline values as covariates. The estimated within- and between-group differences were reported with their respective 95 % confidence intervals (CIs). The significance level was set at $p < .05$ (two-sided). Intervention effects are presented as adjusted mean differences between groups, with 95 % CIs. Cohen's d effect sizes were computed for each time point, defined as the adjusted mean difference between groups divided by the pooled baseline standard deviation. Effect sizes were interpreted as follows: 0.2 indicated a small effect, 0.5 a medium effect, and 0.8 or greater a large effect (Cohen, 1992; Cohen, 2013).

The GEE method, which accommodates intra-correlated repeated measures and missing data due to incomplete visits or dropouts, is particularly suitable for ITT analyses without requiring data imputation in longitudinal studies (Mickey and Greenland, 1989). A sensitivity analysis was conducted under the ITT principle without imputation, using all available participant data without filling in missing values.

2.6.2. Qualitative analysis

Interviews were transcribed verbatim to ensure accuracy. Conventional content analysis (Hsieh and Shannon, 2005) was used to code the transcripts systematically. Two independent coders conducted line-by-line coding using NVivo 12 (QSR International) to extract initial codes, which were then compared, merged, or refined to develop broader subthemes, grouping similar concepts. These subthemes were subsequently organised into overarching themes to capture the core pattern within the data. Data saturation was assessed concurrently with coding, and data collection was considered complete once no new themes or significant insights emerged from additional interviews. Through multiple discussions, the coders reached a consensus on the subthemes and overarching themes, which were subsequently validated and approved by all team members during the authors' meeting.

3. Results

3.1. Participant recruitment and retention

Of 115 individuals screened, 88 individuals satisfied the inclusion criteria and were randomised to one of the two groups (intervention: $n = 46$; control: $n = 42$). 2 participants did not complete the baseline assessment, resulting in 86 individuals being included in the ITT analysis. Throughout the study, 15 participants were lost to follow-up due to being unreachable or declining further assessment, with losses evenly distributed between the two groups. The participant flow diagram is provided in Fig. 1.

3.2. Participant characteristics

Table 2 displays descriptive statistics for the baseline characteristics of parents and adolescents with NSSI. Most parents were married women, with an average age of 42.08 years (SD = 4.42). Approximately 41 % of parents had a junior high school education or lower. Among the adolescents, 87 % were female, with a median age of 14 years (IQR = 2). Additionally, 64 % were diagnosed with Major Depressive Disorder. All adolescents reported experiencing repeated episodes of NSSI, 85 % reported suicidal ideation, and 47 % had attempted suicide at some point. There were no significant differences in baseline characteristics between the intervention and control groups.

3.3. Quantitative results

3.3.1. Primary outcome: knowledge about NSSI

Fig. 2 illustrates that parents in the intervention group experienced significant knowledge improvements from baseline to both T1 and T2 ($p < .05$). Table 3 presents the mean scores of outcome measures for both groups at each of the three assessment time points. Specifically, at T1, the effect was small-to-medium (Cohen's d = 0.42, 95 % CI: 0.051 to 0.80, $p = .027$), and it slightly increased at T2 (Cohen's d = 0.43, 95 % CI: 0.098 to 0.76, $p = .011$). In contrast, the control group showed a decline in knowledge during the same period, demonstrating a clear divergence between the two groups over time.

3.3.2. Secondary outcomes

3.3.2.1. Attitudes. Planned contrasts for the SHAS revealed that the intervention group experienced a significantly greater decline than the control group at T1 (Cohen's d = −0.31, 95 % CI: −0.61 to −0.0041, $p = .047$; Table 3). As shown in Supplementary Table 1, the intervention group experienced a notable decrease in overall SHAS score from baseline to T1 ($p < .001$) and to T2 ($p < .05$). Additionally, the helping cognition dimension showed significant reductions at both T1 and T2 ($p < .01$; Supplementary Table 2).

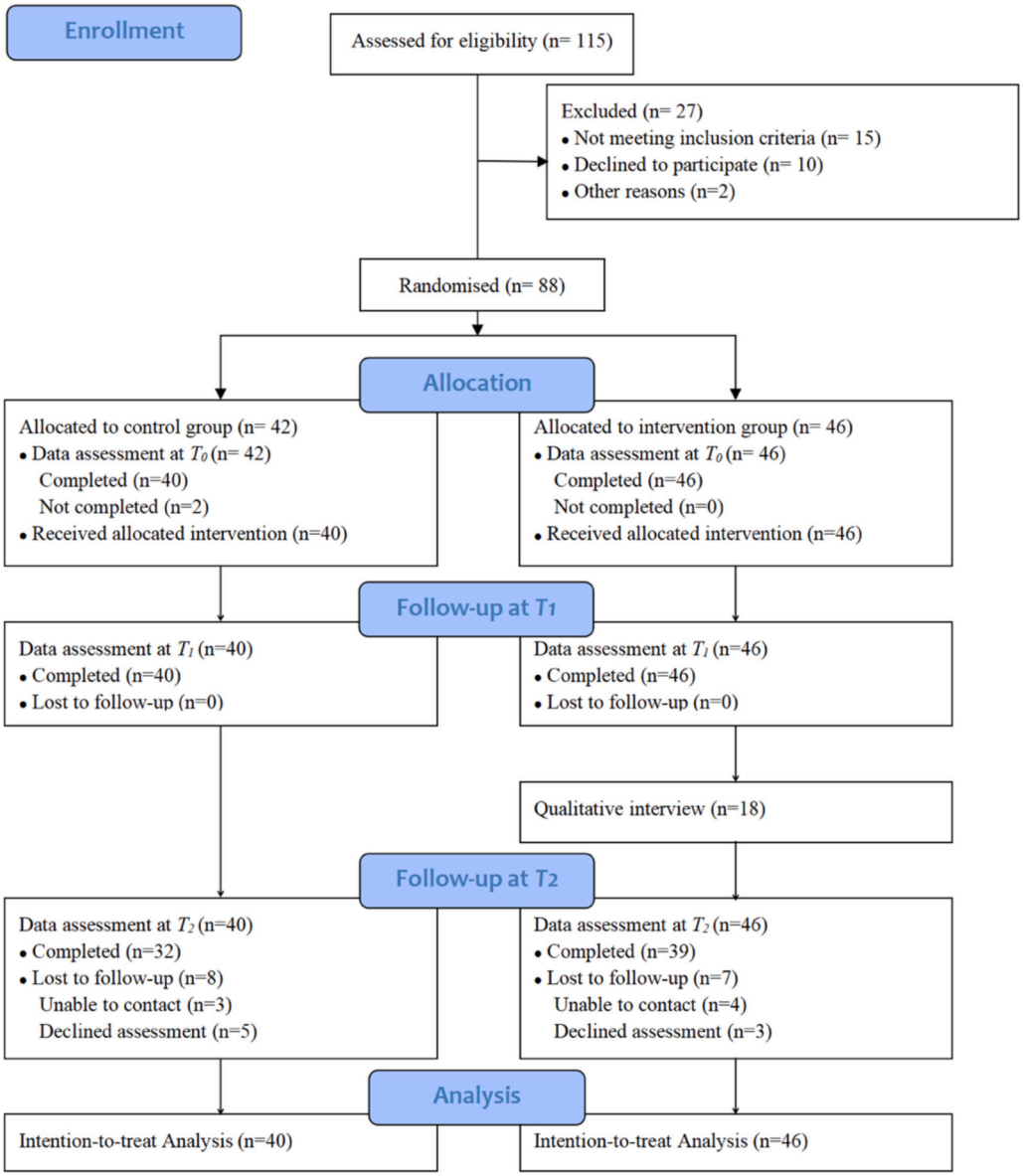

Fig. 1. CONSORT (Consolidated Standards of Reporting Trials) diagram.

3.3.2.2. Stigma. For the ASS, no significant differences in total scores between the two groups were observed at either T1 or T2 ($p = .516$ and $p = .385$, respectively; see Table 3). Notably, the intervention group exhibited a significantly larger decrease in total ASS scores at T1 ($p < .01$) and behavioural dimension scores at both T1 and T2 ($p < .05$) relative to baseline levels (please see Supplementary Table 1).

3.3.3. Sensitivity analysis

The sensitivity analysis results, which compared the primary LOCF-based analysis with ITT analysis without imputation, demonstrated the robustness and reliability of the reported intervention effects (see Supplementary Table 3).

3.4. Qualitative findings

18 participants from the intervention group participated in qualitative interviews, with their characteristics detailed in Supplementary Table 4. The analysis identified three main themes: 1) positive engagement experience; 2) perceived effects on parental empowerment; and 3) constructive feedback. Supplementary Table 5 summarises these themes and subthemes, including representative participant quotations.

Participants reported a highly positive engagement with Project CSH-P, describing it as both relatable and trustworthy due to its professional presentation. They appreciated the programme's convenience and intuitive design, particularly noting the effective integration of visual and auditory elements. The concise duration of the video was commended for facilitating information retention while keeping their attention focused throughout the intervention. Regarding perceived empowerment, parents reported that CSH-P enhanced their understanding of NSSI in adolescents, increased their self-efficacy and confidence in supporting their child's recovery, and strengthened their readiness to respond effectively to NSSI behaviours. In terms of constructive feedback, participants suggested expanding CSH-P into a comprehensive series that includes specific coping strategies. They also recommended integrating digital resources with in-person clinician support and promoting early mental health education within homes and communities.

Table 2
Baseline characteristics of participants.

Variables	Total (*N* = 86)	Control group (*N* = 40)	Intervention group (N = 46)	χ^2/t/z	*P* value
Parent baseline characteristics					
Age (years), mean (SD, range)	42.08 (4.42, 34–53)	41.85 (4.62, 34–51)	42.48 (4.28, 34–53)	−0.450	0.654
Gender, n (%)				0.043	0.835
Female	78 (90.70)	36 (90.00)	39 (87.21)		
Male	8 (9.30)	4 (10.00)	7 (12.79)		
Marital status, n (%)				1.503	0.596[a]
Married	64 (74.42)	31 (77.50)	33 (71.74)		
Unmarried/ widowed/ divorced/ separated / Remarried	22 (25.58)	9 (22.50)	13 (28.26)		
Education level, n (%)				1.570	0.666
Junior high school or below	35 (40.70)	18 (45.00)	17 (36.96)		
Senior high school	22 (25.58)	11 (27.50)	11 (23.91)		
junior college or above	29 (33.72)	11 (27.50)	18 (39.13)		
Economic status, n (%)				0.314	0.947[a]
Poor	8 (9.30)	3 (7.50)	5 (10.87)		
Moderate	52 (60.47)	25 (62.50)	27 (58.70)		
Good	26 (29.23)	12 (30.00)	14 (30.43)		
Type of residence, n (%)				1.989	0.370
Rural	22 (25.58)	13 (32.50)	9 (19.57)		
Town	34 (39.54)	15 (37.50)	19 (41.30)		
Urban	30 (34.88)	12 (30.00)	18 (39.13)		
Adolescent baseline characteristics					
Age (years), median (IQR, range) [b]	14.00 (2.00, 11–18)	14.00 (2.00, 11–18)	14.00 (2.00, 11–17)	−0.022	0.982
Gender, n (%)				0.522	0.533
Male	11 (12.79)	4 (10.00)	7 (12.79)		
Female	75 (87.21)	36 (90.00)	39 (87.21)		
Psychiatric diagnosis, n (%)				0.523	0.843[a]
MDD	55 (63.95)	28 (60.87)	27 (67.50)		
BP	23 (26.74)	13 (28.26)	10 (25.00)		
Others	8 (9.30)	5 (10.87)	3 (7.50)		
Episodes of NSSI, n (%)				1.723	0.423
2–10	24 (27.91)	12 (30.00)	12 (26.09)		
11–50	32 (37.21)	12 (30.00)	20 (43.48)		
>50	30 (34.88)	16 (40.00)	14 (30.43)		
Suicidal ideation—ever, n (%)	73 (84.88)	41 (89.13)	32 (80.00)	1.390	0.238
Suicide attempt—ever, n (%)	40 (46.51)	22 (47.83)	18 (45.00)	0.069	0.793

Abbreviations: MDD, major depressive disorder; BP, Bipolar disorder; NSSI, non-suicidal self-injury; SD, standard deviation; IQR, interquartile range.

[a] Calculated with the Fisher's exact test.

[b] The non-normal data, using median (IQR; range) to describe and calculate with Mann–Whitney *U* test.

4. Discussion

Our results demonstrate the short-term effectiveness of project CSH-P: a mobile-based, self-guided, single-session intervention aimed at empowering parents of adolescents hospitalised for NSSI. Compared to the control group, parents who received the intervention demonstrated significant short-term improvements in their knowledge and attitudes toward adolescents engaging in NSSI, with effect sizes ranging from small to medium. The qualitative results further supported these findings, showing that parents found Project CSH-P engaging and felt better prepared to support their children's recovery. Additionally, participants also provided constructive feedback highlighting areas where the intervention could be further improved.

The observed improvements are consistent with Zimmerman's framework, validating the theoretical foundation for this study. Cognitive empowerment was demonstrated by significant knowledge gains among parents in the intervention group, contrasting with a decline in the control group. This highlights the inadequacy of caregiver support in standard adolescent treatment settings (Branjerdporn et al., 2023; Yesufu-Udechuku et al., 2015). The moderate effect size (Cohen's d = 0.42) suggests that these cognitive changes are clinically meaningful, as greater knowledge has been associated with more positive attitudes and increased confidence in supporting individuals who engaged in NSSI (Ngune et al., 2021). Qualitative findings further demonstrated that the intervention enabled parents to recognise NSSI as a maladaptive coping strategy, equipping them with the knowledge necessary for empathy and informed responses. In clinical practice, this cognitive shift likely served as a foundation for emotional and behavioural empowerment, enhancing parents' ability to communicate effectively with clinicians, advocate for appropriate interventions, and foster a more supportive family environment for their child (French et al., 2024; Krysinska et al., 2020).

Emotional empowerment was evident as quantitative results showed reduced negative attitudes toward adolescents engaging in NSSI among intervention group parents. While the effect size (Cohen's d = −0.31) was small to moderate, even incremental attitudinal shifts may lead to more empathetic parent-child interactions, fostering open communication and reducing conflict—both of which are critical in supporting adolescents experiencing NSSI (Wang et al., 2022). Qualitative findings suggested that the acquired knowledge and coping strategies alleviated distress while fostering self-efficacy and confidence in managing their child's self-injurious behaviours, aligning with previous studies linking psychoeducation to reduced parental distress and increased self-efficacy (Bond et al., 2023; Chiang et al., 2015; Damen et al., 2021; Kelada et al., 2016; Ngune et al., 2021). These emotional shifts are particularly meaningful in clinical settings, where elevated parental stress and caregiver burden can compromise emotional availability, limit effective engagement in treatment, and negatively impact both parental and adolescent psychological well-being (Kandsperger et al., 2023; Sung et al., 2021; Townsend et al., 2021; Zhou et al., 2021). Some parents also advocated for broader mental health education, suggesting that the intervention not only enhanced individual competence but also fostered a sense of social responsibility to support others—a key aspect of emotional empowerment (Ashcraft et al., 2019; Christens and Peterson, 2012).

While the intervention group exhibited notable reductions in stigma, the differences observed between the groups did not reach statistical significance. This finding diverges from studies, such as Bond et al. (2023), which reported reductions in stigma after similar interventions. This difference may stem from our focus on self-stigma in parents rather

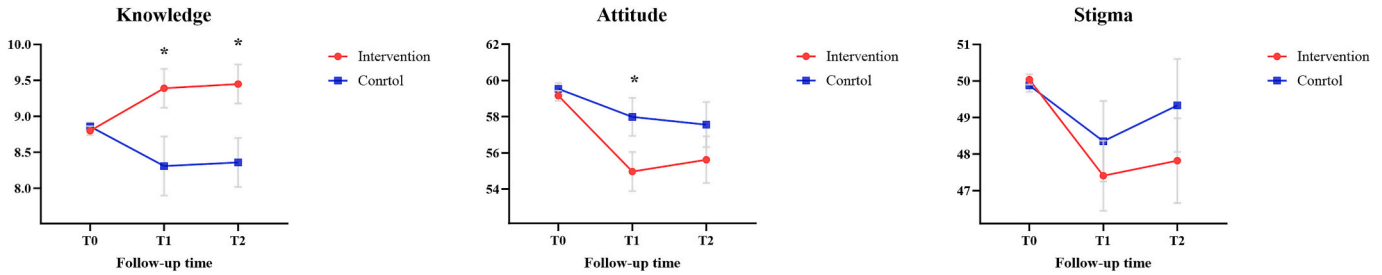

Fig. 2. Estimated marginal means for parental knowledge, attitude, and stigma scores in each group over time, estimated under group-by-measurement-occasion adjusted generalised estimating equation models. T0: baseline; T1: post-intervention; T2: 1-week follow-up. Error bars represent standard errors. *Planned contrast significant at P < .05 level.

Table 3
Generalised estimating equation analysis for the comparison of outcome variables between intervention and control group (n = 86).

Variables	Intervention group (N = 46)[a]	Control group (N = 40)[a]	Adjusted mean difference (95 % CI)[b]	Standardised effect size Cohen's d (95 % CI)	P value
Knowledge					
T0	8.65 (2.73)	9.03 (2.31)	–	–	–
T1	9.24 (2.63)	8.48 (3.38)	1.08 (0.13 to 2.04)	0.42 (0.051 to 0.80)	**0.027**
T2	9.30 (2.53)	8.53 (3.05)	1.10 (0.25 to 1.94)	0.43 (0.098 to 0.76)	**0.011**
Attitudes					
T0	58.48 (9.62)	60.33 (10.08)	–	–	–
T1	54.28 (9.71)	58.78 (11.06)	−3.02 (−6.00 to −0.040)	−0.31 (−0.61 to −0.0041)	**0.047**
T2	54.93 (9.06)	58.35 (11.44)	−1.94 (−5.47 to 1.59)	−0.20 (−0.56 to 0.16)	0.281
Stigma					
T0	50.70 (9.70)	49.13 (10.21)	–	–	–
T1	48.07 (10.67)	47.60 (11.44)	−0.94 (−3.77 to 1.89)	−0.09 (−0.38 to 0.19)	0.516
T2	48.48 (11.04)	48.58 (11.53)	−1.50 (−4.89 to 1.89)	−0.15 (−0.49 to 0.19)	0.385

Standardised effect size (Cohen's d) was calculated as the estimated mean difference divided by baseline standard deviation.
Abbreviation: T0, baseline; T1, post-intervention; T2, 1-week follow-up; CI, confidence interval.
Bold data indicates P < .05.
[a] score was the mean (SD) at each time point observed.
[b] Intervention versus control; the mean difference was estimated by generalised estimating equation models adjusting for the relevant baseline outcome scores.

than public stigma. Our findings suggest that psychoeducation alone may not be enough to address deeply rooted self-stigma, which is often shaped by complex emotional and cultural factors (Sun et al., 2014; Zhang et al., 2018). More interactive and empathetic interventions may be necessary to foster substantial change in self-stigma (Amsalem et al., 2021; Thornicroft et al., 2016).

Behavioural empowerment was evident in qualitative findings, as parents expressed feeling better equipped to engage in conversations about NSSI and apply alternative coping strategies, indicating increased preparedness and confidence in addressing their child's self-injurious behaviours. This finding suggests that the intervention may activate a self-fulfilling prophecy, fostering motivation for further constructive behavioural change. This transition from passive concern to active engagement is clinically significant, as previous research has consistently linked parental involvement in managing adolescent NSSI to improved treatment outcomes (Aggarwal and Patton, 2018; Camelford et al., 2019; Kandsperger et al., 2023). Empowered parents are also more likely to actively seek professional support, adhere to recommended therapeutic strategies, and reinforce positive coping mechanisms at home (Ashcraft et al., 2019; Camelford et al., 2019). Furthermore, by equipping parents with practical skills to manage crises, such interventions may reduce emergency room visits and alleviate burdens on mental health services (Aggarwal and Patton, 2018).

These findings contextualise the current study within a broader digital health landscape, suggesting that brief mobile interventions like Project CSH-P may serve as scalable, low-cost complements to traditional parental support services. Similar to in-person psychoeducation studies (Sun et al., 2014) and online parenting interventions (Korpilahti-Leino et al., 2022), Project CSH-P improved immediate parental skills and attitudes. However, mobile-based interventions offer additional advantages, including increased accessibility, reduced time commitments, and ease of use, making them particularly suitable for resource-limited settings. These findings align with research emphasizing parental preferences for concise and user-friendly formats (Simes et al., 2022; Sophie et al., 2018; Stewart et al., 2018). Additionally, evidence from a meta-analysis by Linardon et al. (2019) confirms the clinical utility of mobile-based interventions in enhancing mental health literacy and coping strategies, reinforcing the potential for mobile-based psychoeducational tools to be integrated into standard care frameworks. Clinicians may consider incorporating similar digital psychoeducational tools as adjuncts to standard care, especially for parents who may be hesitant to participate in traditional, time-intensive psychoeducational programmes.

4.1. Limitations

The limitations of the current study should be acknowledged. First, the sample was predominantly mothers (90.7 %), limiting the generalizability of the findings to fathers. Parental empowerment may manifest differently between mothers and fathers due to variations in caregiving roles, societal expectations, and communication styles. Future research should aim to recruit a more balanced sample to explore potential differences in empowerment processes, challenges, and support needs between mothers and fathers when managing adolescent self-injures. This would provide a broader understanding of the parental empowerment dynamic across different parental roles. Second, recruitment was confined to a single hospital, potentially limiting the applicability of the results to other healthcare settings or cultural contexts. Parents from different socioeconomic backgrounds, geographic regions, and healthcare systems may experience and respond to digital interventions differently. Future studies should consider multi-site recruitment across different clinical and community-based settings to enhance external validity. Additionally, cross-cultural research could examine whether similar interventions yield consistent outcomes across various

healthcare systems and cultural backgrounds. Third, while the intervention demonstrated promising short-term effects, its long-term impact remains unclear, as follow-up assessments were limited to one-week post-intervention. Future research should extend follow-up periods to assess the sustained effects of cognitive, emotional, and behavioural empowerment over time. Finally, behavioural empowerment was assessed qualitatively rather than quantitatively, focusing on parents' stated intentions and perceived readiness rather than objectively measured behavioural changes. Consequently, our study did not capture actual behavioural engagement, highlighting a need for future research to incorporate validated quantitative measures that systematically evaluate long-term behavioural empowerment outcomes.

4.2. Future directions

Participants expressed a desire for additional support, suggesting the potential for developing a comprehensive series of psychoeducational interventions. As a scalable, free, self-guided mobile format, Project CSH-P could be applied across diverse settings and populations. This intervention could be adapted as interim support in outpatient and emergency settings, where parents often seek immediate resources (Kandsperger et al., 2023). Additionally, it could serve as a relapse prevention tool, introduced upon completion of child-focused treatment. Given that fewer than 20 % of adolescents with NSSI seek professional help, broader applications might include integration into community programmes to raise awareness, reduce stigma, and promote early intervention (Kidger et al., 2012; Stallard et al., 2013; Wang et al., 2022). If proven effective, the intervention could become part of a stepped-care model, enabling families of adolescents with less severe behaviours to access treatment strategies while clinicians focus on high-risk cases. Furthermore, since Project CSH-P teaches skills relevant to any adult working with adolescents, it could be extended to teachers, healthcare workers, and other caregivers. This expansion would enhance support networks for adolescents across various contexts, providing comprehensive support systems within their environments.

5. Conclusion

This study offers preliminary evidence for the short-term efficacy of Project CSH-P, a mobile-based, self-guided SSI designed to empower parents of adolescents hospitalised for NSSI. Due to its brevity, low cost, and ease of dissemination, this intervention represents a promising approach for translating research into a sustainable, widely accessible public health strategy for prevention and treatment across diverse settings.

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Declaration of competing interest

The authors declare no conflicts of interest.

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