

The implementation of a digital group intervention for individuals with subthreshold borderline personality disorder

Article (Published Version)

Drews-Windeck, Elea, Evans, Lindsay, Greenwood, Kathryn and Cavanagh, Kate (2022) The implementation of a digital group intervention for individuals with subthreshold borderline personality disorder. *Procedia Computer Science*, 206. pp. 23-33. ISSN 1877-0509

This version is available from Sussex Research Online: <http://sro.sussex.ac.uk/id/eprint/108544/>

This document is made available in accordance with publisher policies and may differ from the published version or from the version of record. If you wish to cite this item you are advised to consult the publisher's version. Please see the URL above for details on accessing the published version.

Copyright and reuse:

Sussex Research Online is a digital repository of the research output of the University.

Copyright and all moral rights to the version of the paper presented here belong to the individual author(s) and/or other copyright owners. To the extent reasonable and practicable, the material made available in SRO has been checked for eligibility before being made available.

Copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.



International Society for Research on Internet Interventions 11th Scientific Meeting
The implementation of a digital group intervention for individuals
with subthreshold borderline personality disorder

Elea Drews-Windeck^{a,b*}, Lindsay Evans^a, Kathryn Greenwood^{a,b}, Kate Cavanagh^b

^a*Sussex Partnership NHS Foundation Trust (SPFT), Worthing BN13 3EP, England*

^b*University of Sussex, Brighton BN1 9RH, England*

Abstract

Context: Systems Training for Emotional Predictability and Problem Solving for Emotional Intensity (STEPPS-EI), a 13-week skills-based group intervention for individuals with subthreshold borderline personality disorder (BPD) has been deemed feasible and clinically effective in primary care [1] [2]. To modernize the service, STEPPS-EI lesson content has recently built onto an eHealth platform (Minddistrict). Due to Covid-19 restrictions, group sessions were additionally delivered remotely via Zoom. This project evaluates the implementation of this digitally blended version of STEPPS-EI within two Sussex Partnership NHS Foundation Trust (SPFT) primary care services. **Methods:** Service users and practitioners who participated in the first two groups from March to July 2021 were invited to take part in a feasibility evaluation investigating recruitment, retention, and attendance rates, in addition to self-reported symptoms (BSL-23, QuEST), quality of life (ReQoL), system usability, and qualitative and quantitative measures designed to shed light on the experience and opinions of service users and practitioners during the intervention. Service users participating in following groups (from July to December 2021) were invited to share their symptom and quality of life outcome data only. **Results:** 14 service users and 5 practitioners agreed to take part in the primary evaluation. Results suggested that 86% of these service users attended at least 75% of the group sessions, and that service users completed on average 70% of the online material. Usability ratings revealed good gradings for Zoom from all participants, yet lower gradings for Minddistrict. Further analyses revealed a generally positive attitude towards digital STEPPS-EI from all parties and practical suggestions on how to improve the intervention. 11 service users from following groups agreed to share their data. Bayesian analyses were conducted for the data of service users who provided ratings at both timepoints. Evidence was found for a decrease in BSL-23 scores and an increase in ReQoL ratings from baseline to post-intervention. Incomplete self-report data-sets limits conclusions. **Conclusions:** It was found that the implementation of STEPPS-EI delivered in a blended digital format was feasible. The online delivery might increase service users' engagement with the material and group sessions. Yet more training and support on the use of Minddistrict may be required to increase usability. **Implications:** It may be possible to effectively

* Corresponding author. Tel.: +441273 876638
E-mail address: e.drews-windeck@sussex.ac.uk

implement digital interventions for individuals with subthreshold BPD. However, more research on the effect of these on symptom outcomes should follow.

© 2022 The Authors. Published by Elsevier B.V.

This is an open access article under the CC BY-NC-ND license (<https://creativecommons.org/licenses/by-nc-nd/4.0>)

“Peer-review under responsibility of the scientific committee of the International Society for Research on Internet Interventions 11th Scientific Meeting”

Keywords: digital intervention; eHealth; tellehealth; emotional instability; Borderline Personality

1. Context

1.1. Subthreshold Borderline Personality Disorder

Borderline Personality Disorder (BPD) is a prevalent and severe mental health disorder, affecting between 0.5 and 2.7% of the population [3]. Individuals diagnosed with BPD often present with intense and unstable emotionality, impulsive behaviors, issues with interpersonal relations and unstable identity [4], additionally, they may experience additional difficulties linked to the stigma that is still attached to BPD [5]. Research on individuals who present with subthreshold symptomatology or features of BPD commonly experience comorbid psychiatric disorder, report greater risk taking, suicidality, self-injury [6], alcohol and substance abuse [7], lower quality of relationships [8], poorer educational and social functioning [9], and are likely to fall through the gaps of mental health services escalating their symptoms over time [10].

1.2. Digital Interventions

Using brief, early, and targeted digital interventions, may help to address the lack of access to care for this population and allows for the inclusion of individuals with subthreshold presentations before their symptoms worsen [11] [12]. Such interventions generally report good symptom improvement and general positive psychopathology outcomes [12] [13]. However, previous research has identified a few limitations, including traditionally high levels of drop-out, especially for self-directed computer-based interventions, increased risk of bias due to self-reporting symptom outcomes and a small number of studies that have tested the potential of digital interventions in clinical practice [14]. Research has shown that digital interventions can be a good solution to include individuals who have barriers to accessing in-person treatment and to tackling some of the difficulties associated with BPD treatment, i.e., stigma, low treatment-seeking [15], high drop-out [1] and difficulties common to healthcare providers, i.e., difficulties with staffing, updating content quickly and efficiently, decreasing environmental impact [16]. A review on the use of digital intervention in BPD found indications that digital interventions report good results in terms of feasibility, acceptance, and usability with some indications that reductions in symptomatology were also occurring [15]. While, the quality of evidence is still incipient, there seem to be strong suggestions that digital interventions, especially when delivered in a practitioner-guided format, can increase access to therapy and engagement with the intervention. A recent systematic review on digital intervention for individuals with BPD, Emotionally Unstable Personality Disorder (EUPD) and related symptoms, found that guided eHealth interventions may offer the largest effects on symptomatology as well as general wellbeing [17].

1.3. Previous implementations of STEPPS-EI

The Systems Training for Emotional Predictability and Problem Solving for Emotional Intensity difficulties (STEPPS-EI) is a specialist cognitive behavioral skills-based group intervention available to NHS primary care services in the United Kingdom [18]. It is a derivative of STEPPS [19], a NICE (National Institute for Health and Care Excellence) recommended group intervention which focuses on psychoeducation, emotion management training and behavior management training for individuals with BPD. STEPPS-EI is shorter and targeted at the treatment of

individuals who present with subthreshold symptomatology such as emotional intensity difficulties. Previous research on the use of this intervention has found STEPPS-EI in-person to be feasible [1] with adequate recruitment and retention rates, and clinically effective with decreased symptomatology in service users from pre to post intervention [1] [2]. Qualitative investigations from service users in these previous groups have provided generally positive feedback, i.e., self-identified changes in emotional intensity, paperwork and reinforcement cards were found helpful to look back when experiencing difficulties. However, service users also reported some issues around handling other group members (interpersonal sensitivities) and wished for the intervention to be longer [1]. A separate qualitative enquiry to STEPPS-EI groups similarly identified that service users found the intervention to be a positive and supportive environment and reporting changes in their emotions, yet that group-dynamics could be difficult for them and that additional management by practitioners might be required [20]. The SPFT has since decided to further develop and modernize the intervention under a Quality Improvement program to tackle some of the difficulties outlined above. This included moving most of the content and individual exercises delivered in in-person lessons onto an eHealth web-based platform. This coincided with the Covid-19 pandemic and restrictions on in-person contact which led to the decision to additionally run groups remotely via Zoom.

1.4. Previous research on blended digital group interventions

The idea of delivering a digitally blended group intervention is relatively novel. While previous reviews have found digital group interventions to be similarly effective to in-person groups on reducing mental health symptoms, it has been reported that service users can experience a decrease in therapeutic alliance [21] and connectedness to other group members [22]. However, it is often reported that delivering group interventions online can increase accessibility and adherence to therapy [23]. Equally, blended mental health interventions are also found to decrease drop-out [24], increase treatment adherence, while resulting in similar in symptomatology as in-person therapy [25]. A recent trial investigated a digitally blended cognitive behavioural group intervention for emotional disorders and found high acceptance and satisfaction ratings [26]. Yet, more research is necessary to determine their efficacy.

1.5. The present evaluation

This project evaluates the implementation of the digitally blended version of STEPPS-EI within two primary care services. The primary aim of the present evaluation is to use the data collected from the first two digitally blended STEPPS-EI groups to evaluate the feasibility of the intervention. The following outcomes are investigated: usability ratings, service user experience and practitioner experience. Lastly, symptom outcomes relating to BPD symptomatology and quality of life are analyzed for data from all service users participating in the digital STEPPS-EI service in the year that the service was first implemented. Results are compared to previous research where possible.

2. Methods

2.1. Participants

The 17 service users who participated in the first two primary care STEPPS-EI groups running in SPFT from March to July 2021 (Cohort 1) were invited to take part in the present evaluation, as well as the 5 practitioners that facilitated these first two groups. All 38 service users participating in following groups in these services, starting between July and December 2021 (Cohort 2) were invited to share their self-reported symptom outcome data only. Service users invited to STEPPS-EI had presented to primary care mental health services with subthreshold BPD symptoms.

2.2. Procedure

The STEPPS-EI procedure is described by Barber and colleagues [1]. The changes to the intervention since digitalization included: service users complete the content and exercises as part of home-practice via Minddistrict. In addition, they participate in weekly group sessions on Zoom. Service users further receive reminders via email to complete their online material. For the evaluation, service users who participated in STEPPS-EI groups in March 2021

(Cohort 1) agreed to share their data for the present evaluation which was collected during the intervention as part of a Quality Improvement program. This involved feasibility, system usability, and self-reported symptom data as well as a range of quantitative and qualitative experience outcome measures. The practitioners who facilitated these first two groups were invited to share their ratings of system usability, responses to qualitative and quantitative measures on their experience and opinion of facilitating the intervention. In addition, to allow for a more precise estimate of the treatment effect on symptomatology, all service users participating in following groups (Cohort 2) were approached and invited to share their self-reported symptom outcome data only. Figure 1 below illustrates this procedure.

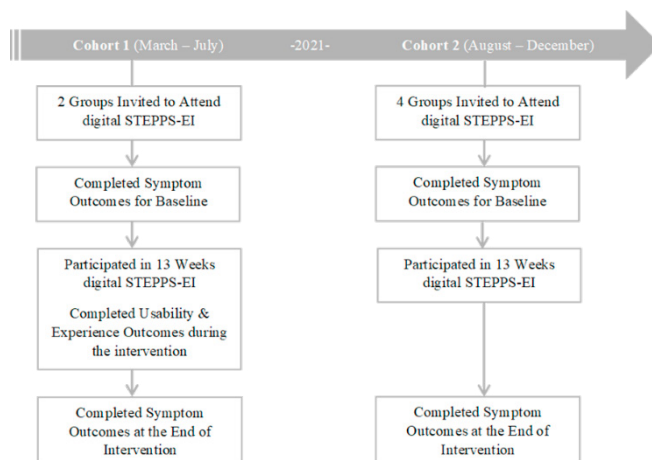


Fig. 1. Pictorial description of the digital STEPPS-EI Procedure including timing of outcome measures for Cohort 1 and Cohort 2.

2.3. Measures

Feasibility outcome measures were investigated through calculating recruitment, retention, and attendance of the group lessons as well as completion of the Minddistrict home practice. These are reported in percentages and computed in the same manner as [1]. System usability ratings from service users and practitioners were reported with the system usability scale (SUS) [27] administered separately for Zoom and Minddistrict. The SUS is scored between 0 and 100, with a rating of 68 considered ‘average’ usability [28]. Service user experience was reported through the patient experience questionnaire (PEQ) [29], weekly group session rating scales (GSRS) [30], and a qualitative follow-up interview, including a mix of novel items and items from the previous STEPPS-EI feedback form [1]. Practitioners further completed a practitioner interview including qualitative questions from the psychological wellbeing practitioner interview schedule [31], quantitative questions from the credibility and expectancy questionnaire [32] and one question asking to rate their confidence to deliver the intervention. Finally, service users from Cohort 1 and 2 shared self-reported symptom outcome data regarding symptom severity as per the BSL-23 with scores ranging from 0 to 4 [33] and the QuEST with scores ranging from 27 to 72 [34], as well as quality of life (ReQoL-10) with scores ranging from 0 to 40 [35].

2.4. Data Analysis

Data for feasibility, system usability and quantitative experience outcomes from service users and practitioners are described narratively. Qualitative data from service users and practitioners are included in two separate thematic analyses following [36] procedure. Data on symptomatology and quality of life are investigated through Bayesian analyses in R, comparing baseline to end of intervention ratings for individuals that completed both timepoints. Bayesian models are less likely to overestimate effects compared to null-hypothesis significance testing (NHST) [37] and don’t rely on p-values, which in NHST have commonly been shown to over or underestimate effects based on sample size [38]. In a small sample, the level of significance can be negatively impacted as the likelihood of introducing random error increases. Bayes factors in comparison are more informative than p-values and have higher predictive success with smaller samples, as long as reasonable prior distributions and true effect sizes are identified

[37]. Furthermore, they don't rely on approximations, arbitrary significance levels, or point estimates [39]. Due to the exploratory nature and the novelty of online delivery, a uniform distribution ranging from -1 to 1 is used as prior distribution and Bayes factors are interpreted following [40] cut-off values. Cohen's D effect sizes are additionally calculated according to [41] in order to effectively compare the magnitude of effect to previous research.

3. Results

15/17 (88%) service users from Cohort 1 who were invited to participate in the STEPPS-EI groups agreed to share their data. 11/28 (39%) service users from Cohort 2 additionally agreed to share their symptom outcome data.

3.1. Feasibility

From the service users in Cohort 1, one did not accept the place due to it being delivered online. All the remaining participants (N = 14) attended at least one STEPPS-EI group session and completed at least 1 Minddistrict Module (recruitment = 93%). Of the 14 participants that accepted the intervention, 12 participants attended 75% or more of the online group sessions (retention = 86%). The average attendance across all participants was 10.21 sessions (SD = 2.86) with 2 individuals attending all 12 sessions and the introduction. Minddistrict module completion rates were slightly lower however, with 7 participants completing 75% of the online modules (50% of those who accepted the place) and only one participant completing all modules. The mean completion rate across all participants for the modules on Minddistrict was 11.21 (SD=3.85), which relates to 70.06% of all online material. Figure 2 below outlines the average attendance and module completion rates for each week of the intervention.

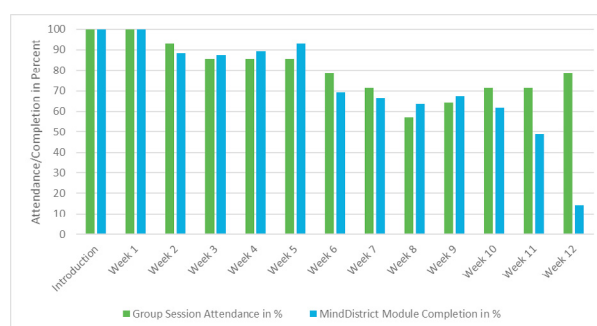


Fig. 2. Cohort 1 group attendance and online module completion averaged across 14 service users.

3.2. System Usability

10 service users and all 5 practitioners from Cohort 1 completed the SUS for Zoom and Minddistrict. Overall, Zoom was rated highly by both service users (SUS = 73.3) and practitioners (SUS = 76), indicating that respondents found Zoom useful and helpful for STEPPS-EI. Although all items were scored above the average, the lowest rated item indicated that service users found Zoom somewhat awkward to use. The ratings for Minddistrict were generally lower and more dispersed with service users rating Minddistrict considerably lower (SUS = 55.5) than practitioners (SUS = 64). The lowest rated item indicated that service users found the use of Minddistrict unnecessarily complex.

3.3. Service User Experience

10 service users from Cohort 1 completed the PEQ. Overall, responses from service users indicated positive experiences with the intervention. The items that were rated the highest indicated that service users believed that practitioners always listened to them and that they had confidence in the practitioners. Weekly, between 2 and 12 service users completed the GSRs. Most ratings indicated a consistently positive group experience and high group alliance, with all weeks being rated above average. 10 service users provided qualitative feedback through the follow-

up interview; 6 individual themes were identified from this. The first two themes related to comments on the core program of STEPPS-EI and identified that the intervention helped service users to develop an understanding of their own difficulties and helped to teach new skills. Furthermore, service users had an understanding that they needed to be ‘ready’ or ‘in the right space’ for the intervention. The next two themes that were identified related to comments on the digital delivery of STEPPS-EI. It was identified that the remote delivery of STEPPS-EI influenced the accessibility and engagement with the intervention (e.g., no travel, flexibility in home practice, reduced social anxiety in group, ability to participate in group on ‘bad-days’). Service users also identified that the interaction with other service users or the practitioners had different demands due to the online delivery (e.g., harder to make connections although not impossible, practitioners need to manage participation more). The last two themes that were identified were a general wish from service users for ‘more’ (e.g., time, depth, guidance, materials) and service users offering suggestions to improve the intervention.¹

3.4. Practitioner Experience

All practitioners from Cohort 1 responded to the pre-intervention facilitator survey (N = 5). Of these, 3 indicated having experience of working with patients via digital platforms. One of the practitioners left the service after the seventh group session. Out of the remaining 4, 3 practitioners completed the post-intervention survey. All three indicated that over the course of the intervention their ability to facilitate groups had improved. Overall, practitioners indicated at pre-intervention that they found the intervention logical (M = 86.60, SD = 20.42), which consolidated further at post-intervention (M = 90.33, SD = 6.43). They also indicated numerically greater confidence in delivering the intervention after they had delivered it (M = 77.33, SD = 24.11) compared to before intervention start (M = 66.60, SD = 13.27). However, practitioner’s opinions on how successful this intervention would be in reducing service user’s symptoms were not as strong and did not change from pre (M = 69, SD = 14.62) to post (M = 67.67, SD = 18.72) intervention. In addition, all practitioners indicated that they believed the intervention to be a ‘good fit’ for the service users and for the service they work for. Qualitative data from the facilitator survey identified 4 individual themes. It was identified that the interaction with service users was less personal but safer due to the online delivery (e.g., service users feel safer and more anonymous in group). Practitioners further identified that they themselves and service users needed more guidance for the intervention (e.g., more guidance and facilitation needed from peers, service users need more guidance on navigating the platforms). The next theme identified that the online delivery made therapy more accessible and convenient (e.g., no travel, increasing accessibility for therapy). The last theme that was identified from practitioner feedback was that there are still technical and practical difficulties that needed to be resolved (e.g., on allocation of online content, format of the online content, length of intervention).

3.5. Symptom Outcomes

From the 25 service users that agreed to share their symptom outcome data, 8 service users completed the BSL-23 at baseline and end of intervention. 8 service users completed QuEST at both timepoints and 10 reported quality of life ratings at both timepoints. Table 1 below outlines means for each timepoint and statistical results from analyses.

Table 1. Bayesian analyses for symptom outcome data from service users completing a baseline and post-intervention outcome

Measure	N	Baseline Mean (SD)	Intervention End Mean (SD)	Mean difference	Bayes factor (BF)	Cohen’s <i>d</i> (<i>eff. size</i>)
BSL	8	1.76 (0.74)	0.76 (0.51)	1.055	3.75	1.573
QuEST	8	41.25 (6.58)	39.25 (12.30)	0.195	0.38	0.202
ReQoL	10	17.20 (6.27)	23.60 (7.31)	-0.916	3.95	0.939

Results from the Bayesian analysis of symptom severity measured by BSL-23 from baseline to post-intervention provide moderate evidence in favor of the alternative hypothesis (BF = 3.75), and hence supporting the theory that

¹ More detail from this thematic analysis is available from the first author.

there is a change in these ratings over time, with symptoms decreasing from baseline ($M = 1.76$, $SD = 0.74$) to post-intervention ($M = 0.76$, $SD = 0.51$). Furthermore, a large effect size (as per [41]) was found ($d = 1.6$). For the analysis of symptom severity measured by QuEST from baseline to post-intervention, anecdotal evidence for the null hypothesis (H_0) was found ($BF = 0.38$), hence the findings were inconclusive as to whether there was a difference present for QuEST scores from baseline ($M = 41.25$, $SD = 6.58$) to post-intervention ($M = 39.25$, $SD = 12.30$). In line with this, a small effect size was identified ($d = 0.2$). The final analysis of quality-of-life ratings (ReQoL) from baseline to post-intervention provides moderate evidence in favor of the alternative hypothesis ($BF = 3.95$), supporting the theory that there is a change in ReQoL symptom outcomes over time, with quality of life increasing from baseline ($M = 17.20$, $SD = 6.27$) to post-intervention ($M = 23.60$, $SD = 7.31$). This was supported by a large effect size ($d = 0.9$).

4. Discussion

The digitally blended version of STEPPS-EI implemented within the two primary care services and was found feasible and promising in terms of stakeholder experience, symptom, and quality of life outcome measures.

4.1. Conclusions on feasibility and engagement with the intervention

Feasibility results suggested high recruitment, retention, and attendance to the intervention. These rates were higher still than in previous in-person STEPPS-EI groups [1], which reported 75% recruitment, 43% retention, and service users attending an average of 5 and a half sessions, roughly 47% of the intervention. This mirrors previous reports in the literature which suggest higher engagement with and adherence to therapy for digital therapeutic interventions in the context of BPD [42]. The literature on digital self-help interventions similarity often reports high and consistent engagement with the intervention, yet high drop-out rates, especially when this is measured by completing follow-up outcome measures [43] [44] [17]. It is often reported that individuals with BPD symptomatology may find the ending of therapy particularly difficult [45]. This may explain part of the drop-out toward the end of the intervention. It may also be that the use of technology for mental health interventions in populations with BPD symptomatology initially increases engagement, but that different types of technology result in lower long-term adherence (i.e., self-directed web-based interventions) than others (i.e., telehealth).

4.2. Conclusions on the usability of the intervention

The second set of results investigated the usability of the technology used for STEPPS-EI. It was found that Zoom was identified as “good” or “acceptable” [46] with ratings from and service users both being above average [28]. Meanwhile, ratings for the STEPPS-EI modules on Minddistrict were lower, identifying the platform as “OK” or “marginally acceptable” [46] with practitioner’s and service user’s ratings being below average for usability [28]. This may indicate that the STEPPS-EI content on Minddistrict could require some further development and may highlight the need for additional training and support when engaging with the platform. Previous research suggests that high usability ratings are possible for digital interventions for BPD, and these resources may help with the development of this intervention [47] [48]. Investigations on the SUS has found that individuals who have more experience with using technology generally, and who are more familiar with a specific type of technology will indicate higher usability score [49]. It is likely that service users and practitioners were already familiar with Zoom when they started using this for the STEPPS-EI intervention in 2021. Furthermore, practitioners received training on Minddistrict before the start of the intervention. This increased experience and familiarity with the platforms may account for some of the difference in scores. Providing more guidance and help to service users on the navigation of Minddistrict may hence increase usability ratings in the future.

4.3. Conclusions on service user’s experiences with the intervention

Investigations around service user experience during the intervention consistently identified that service users were happy with the role and helpfulness of their practitioners, had a good group experience and high group alliance in most of the weeks. Research on digital interventions in BPD populations that included acceptability and satisfaction

measures generally found similar results service users indicating the technology to be helpful and high satisfaction ratings [50]. Equally, the themes identified for from qualitative feedback of digital STEPPS-EI service users resemble that of in-person investigations, i.e., wanting the intervention to be longer, having gained self-reflective skills, identifying helpfulness of group environment [1]. However, some previously reported issues with i.e., handling other group members [1], difficulties with group dynamics and the need for increased management of participation from practitioners [15], seem to have been improved, as both service users and practitioners revealed that service users felt safer and less anxious during group meetings. This goes in line with research on other digital mental health interventions for this population broadly, which report similar themes including the helpfulness of specific elements of the intervention, the structure of the intervention and the flexibility, yet equally commenting on technical difficulties, usability problems, or the lack of connection as difficult [51] [52]. Overall, the present results support previous research, reporting that blended mental health interventions may be especially helpful, as these allow for flexible working within a therapeutic context, while still enabling users to make connections with peers [42].

4.4. Conclusions on practitioner's experience with the intervention

Results from investigations around practitioner experience in facilitating this intervention identified that they found the intervention to be logical, believed it was a good fit for the service user group and for the service they worked for, intervention yet seemed to not be sure whether the intervention would improve symptomatology in the service users. The themes identified from qualitative analyses are similar to previous research on common barriers to working digitally identified by mental health staff, which include the accessibility of material, receiving adequate training and guidance [14]. Research on previous digital interventions for individuals with BPD that included qualitative reports from practitioners equally identified that while practitioners needed more time to familiarize themselves with the intervention, they felt supported by the intervention which provided emotional relief to them [51] and that they found the support of a digital tool as helpful for therapy [52]. Practitioners also identified that service users were more autonomous [51] and that their clinical progress occurred faster [52] compared to traditional in-person services. It is widely recognized that the opinions and attitudes of the practitioners that facilitate these digital interventions greatly influences the acceptance and successful implementation of these services [53]. Therefore, it may be important for future digital interventions to focus on providing additional support, training, and guidance for these professionals.

4.5. Conclusions on symptom outcome measurements

Lastly, the statistical analyses of the symptom outcome data moderately evidence that there was a decrease in BPD symptomatology (measured by BSL-23) and an increase in quality of life (ReQoL) from baseline to post-intervention in service users attending the STEPPS-EI groups in 2021. The BSL-23 measure has recently been found to be able to distinguish between various levels of symptom severity [54]. According to this, the present results from service users fall into the moderate severity classification range at baseline (1.76) and mild range at intervention end (0.76). No previous research on STEPPS-EI groups had included these scales as outcome measures. However, previous research on individuals diagnosed with BPD reported BSL scores between 2.05 and 2.79 which reduce to 1.57 or 1.64 after engaging in therapy [55][56]. Comparably, the STEPPS-EI service users scored lower at baseline and reported a larger reduction in score over time. The present results are also in line with previous research on digital interventions for individuals with BPD or related symptoms which finds symptom reductions and increased wellbeing [15][17]. However, the present study found only a small change in symptom severity as measured by the QuEST (2 point decrease, $d = 0.2$) and the analysis was deemed inconclusive. This is contradictory to previous research on in-person STEPPS-EI which identified significant reductions with a large effect size (11.26 point decrease, $d = 1.06$ [1], and 11.32 point decrease, $d = 0.95$ [2]). One possible explanation for the inconclusiveness of the present results may stem from an inability to detect an effect due to inadequate sample size, as previous studies included larger sample sizes ($N = 130$ [1] and $N = 82$ [2]) and found an effect. Another conclusion may be that the QuEST is less able to discriminate symptoms in individuals who present with lower levels of symptomatology, as it was originally based on DSM-IV criteria for BPD and designed to measure symptomatology in individuals diagnosed with BPD [34].

5. Limitations & Future Developments

The participant numbers for both parts of the study are lower than previous studies on digital interventions [15], or in-person STEPPS-EI [1]. Furthermore, the outcome completion rates were low, with only 40% (ReQoL) and 32% (BSI-23, QuEST) of the 25 individuals who agreed to share their data completing outcome measures at both baseline and end of the intervention. Nonetheless, the results outlined for recruitment and retention of service users throughout the intervention suggest the feasibility and scalability of digital STEPPS-EI. Low outcome completion numbers may be more reflective of evaluation recruitment difficulties, service users' lower engagement with the platform towards the end of the intervention, and technical difficulties with the allocation of outcome measures on Minddistrict rather than treatment recruitment difficulties. Future research may hence benefit from ensuring important outcome measures are recorded via traditional methods and contact service users before the intervention start. Furthermore, future services will benefit from additional support for dealing with technical difficulties, additional resources and training aimed to promote service-user's continuous and consistent engagement with the platform.

Further limitations include the non-existence of follow-up data in order to identify whether any improvements in symptomatology and quality of life are maintained after intervention end. Further research may address this question in subsequent digital STEPPS-EI cohorts. It is also of note that service users reported lower symptoms as per QuEST at baseline compared to previous research [1] [2], hence the question remains whether the results from this digital version of STEPPS-EI would generalize to service users who join the groups with higher levels of symptoms and lower quality of life. Lastly, this study was conducted on service users participating in this digital intervention in 2021. There was no alternative service available for these service users at the time, hence conclusions may be limited to this context.

Acknowledgements

We would like to thank the SPFT digital and Minddistrict team for aiding the conceptualization, data pull and providing training on Minddistrict for the evaluation. Further, we thank the two participating services, Brighton and Hove Wellbeing Service and Health in Mind, East Sussex, all service users, and practitioners for participating.

References

- [1] Barber, William, Frances Apps, Clara Strauss, Helen Startup, and Juliet Couche. (2021) "Subthreshold personality disorder: how feasible is treatment in primary care?" *The Cognitive Behaviour Therapist* **14** (12).
- [2] Hezelyova, Ivana, Hannah Cribben, Natasha Melunsky, Shumona Moalypour, Huw Goodwin, Carla Maños Serrat, Hamid Rahmanian, and Roman Duncko. (2021) "Investigating Effectiveness and Predicting Outcome and Dropout from Systems Training for Emotional Predictability and Problem Solving for Emotional Intensity Difficulties (STEPPS EI) in UK Primary Care." *Journal of Personality Disorders* **35** (6).
- [3] McManus, Sally, Paul E. Bebbington, Rachel Jenkins, and Terry Brugha. (2016) Mental health and wellbeing in England: the adult psychiatric morbidity survey 2014. *NHS digital*.
- [4] Gunderson, John G., Sabine C. Herpertz, Andrew E. Skodol, Svenn Torgersen, and Mary C. Zanarini. (2018) "Borderline personality disorder." *Nature Reviews Disease Primers* **4** (1): 1-20.
- [5] Proctor, Jessica Margot, Sharon Lawn, and Janne McMahon. (2020) "Consumer perspective from people with a diagnosis of Borderline Personality Disorder (BPD) on BPD management—How are the Australian NHMRC BPD guidelines faring in practice?" *Journal of Psychiatric and Mental Health Nursing* **28** (4): 670-681.
- [6] Kaess, Michael, Gloria Fischer-Waldschmidt, Franz Resch, and Julian Koenig. (2017) "Health related quality of life and psychopathological distress in risk taking and self-harming adolescents with full-syndrome, subthreshold and without borderline personality disorder: rethinking the clinical cut-off?" *Borderline personality disorder and emotion dysregulation* **4** (1): 1-12.
- [7] Vest, Noel A., Kyle T. Murphy, and Sarah L. Tragesser. (2018) "Borderline personality disorder features and drinking, cannabis, and prescription opioid motives: Differential associations across substance and sex." *Addictive behaviors* **87**: 46-54.
- [8] Howard, Kristen P., Sophie A. Lazarus, and Jennifer S. Cheavens. (2022) "A longitudinal examination of the reciprocal relationship between borderline personality features and interpersonal relationship quality." *Personality Disorders: Theory, Research, and Treatment* **13** (1): 3.
- [9] Thompson, Katherine N., Henry Jackson, Marialuisa Cavelti, Jennifer Betts, Louise McCutcheon, Martina Jovev, and Andrew M. Chanen. (2019) "The clinical significance of subthreshold borderline personality disorder features in outpatient youth." *Journal of personality disorders* **33** (1): 71-81.

- [10] Barnicot, Kirsten. (2020) "Evidence-based psychological interventions for borderline personality disorder in the United Kingdom—who falls through the gaps?." *Journal of Psychological Therapies* **5** (2): 148-167.
- [11] Temes, Christina M., and Mary C. Zanarini. [2019] "Recent developments in psychosocial interventions for borderline personality disorder." *F1000Research* **8**.
- [12] Lyng, Jim, Michaela A. Swales, Richard P. Hastings, Tracy Millar, and Daniel J. Duffy. (2020) "Outcomes for 18 to 25-year-olds with borderline personality disorder in a dedicated young adult only DBT programme compared to a general adult DBT programme for all ages 18+." *Early Intervention in Psychiatry* **14** (1): 61-68.
- [13] Spong, A. J., I. C. H. Clare, Julieta Galante, M. J. Crawford, and P. B. Jones. (2021) "Brief psychological interventions for borderline personality disorder. A systematic review and meta-analysis of randomised controlled trials." *Clinical psychology review* **83**: 101937.
- [14] Baños, Rosa M., Rocío Herrero, and M. Dolores Vara. (2022) "What Is the Current and Future Status of Digital Mental Health Interventions?" *The Spanish Journal of Psychology* **25**.
- [15] Frías, Álvaro, Laia Solves, Sara Navarro, Carol Palma, Núria Farriols, Ferrán Aliaga, Mònica Hernández, Meritxell Antón, and Aloma Riera. (2020) "Technology-based psychosocial interventions for people with borderline personality disorder: a scoping review of the literature." *Psychopathology* **53**(5): 254-263.
- [16] Iliakis, Evan A., Anne K. I. Sonley, Gabrielle S. Ilagan, and Lois W. Choi-Kain. (2018) "Treatment of borderline personality disorder: is supply adequate to meet public health needs?." *Psychiatric Services* **70** (9): 772-781.
- [17] Drews-Windeck, Elea, Kathryn Greenwood, and Kate Cavanagh (2022). "A systematic review and meta-analysis of digital interventions targeted at individuals with Borderline Personality Disorder (BPD), Emotionally Unstable Personality Disorder (EUPD) and related symptoms." Manuscript Submitted for Publication.
- [18] Blum, Nancee. S., N. E. Bartels, Don St. John, Bruce Pfohl, & R. Harvey. (2016). "Managing Emotional Intensity – Early Intervention. In STEPPS EI". United Kingdom, Level One Publishing and Sussex Partnership Foundation.
- [19] Blum, Nancee, Don St. John, Bruce Pfohl, Scott Stuart, Brett McCormick, Jeff Allen, Stephan Arndt, and Donald W. Black. (2008) "Systems Training for Emotional Predictability and Problem Solving (STEPPS) for outpatients with borderline personality disorder: a randomized controlled trial and 1-year follow-up." *American Journal of Psychiatry* **165** (4): 468-478
- [20] Harland, Sabine. (2018) *Investigating the effectiveness of emotion regulation skills groups and service user perspectives*. United Kingdom, Canterbury Christ Church University.
- [21] Marton, Kacey, and Nick Kanas. (2016) 'Telehealth Modalities for Group Therapy: Comparisons to In-Person Group Therapy'. *International Journal of Group Psychotherapy* **66** (1): 145–50.
- [22] Lopez, Amy, Brian Rothberg, Emily Reaser, Sarah Schwenk, and Rachel Griffin. (2020) 'Therapeutic Groups via Video Teleconferencing and the Impact on Group Cohesion'. *MHealth* **6** (13).
- [23] Banbury, Annie, Susan Nancarrow, Jared Dart, Leonard Gray, and Lynne Parkinson. (2018) 'Telehealth Interventions Delivering Home-Based Support Group Videoconferencing: Systematic Review'. *Journal of Medical Internet Research* **20** (2): e8090.
- [24] Erbe, Doris, Hans-Christoph Eichert, Heleen Riper, and David Daniel Ebert. (2017) 'Blending Face-to-Face and Internet-Based Interventions for the Treatment of Mental Disorders in Adults: Systematic Review'. *Journal of Medical Internet Research* **19** (9): e306.
- [25] Dülßen, Patrick, Eileen Bendig, Ann-Marie Kuchler, Helen Christensen, and Harald Baumeister. (2020) 'Digital Interventions in Adult Mental Healthcare Settings: Recent Evidence and Future Directions'. *Current Opinion in Psychiatry* **33** (4): 422–31.
- [26] Díaz-García, Amanda, Alberto Gonzalez-Robles, Isabel Fernandez-Felipe, Diana Castilla, Cristina Botella, and Azucena Garcia-Palacios. (2020) 'Blended transdiagnostic group CBT for emotional disorders: opinion of the online modules and group sessions.' *Annual Review of Cybertherapy and Telemedicine* **18**: 213-215
- [27] Brooke, John. (1996) "SUS: a "quick and dirty" usability scale." *Usability evaluation in industry*, London, Taylor & Francis.
- [28] Lewis, James R., and Jeff Sauro. (2018) "Item benchmarks for the system usability scale." *Journal of Usability Studies* **13** (3).
- [29] The National Collaborating Centre for Mental Health. (2018) "The Improving Access to Psychological Therapies Manual", *The National Collaborating Centre for Mental Health*: 08101.
- [30] Duncan, Barry L., Scott D. Miller, Jacqueline A. Sparks, David A. Claud, Lisa Rene Reynolds, Jeb Brown, and Lynn D. Johnson. (2003) "The Session Rating Scale: Preliminary psychometric properties of a "working" alliance measure." *Journal of brief Therapy* **3** (1): 3-12.
- [31] Turner, Joshua, Joanne C. Brown, and Dianne T. Carpenter. (2018) "Telephone-based CBT and the therapeutic relationship: The views and experiences of IAPT practitioners in a low-intensity service." *Journal of psychiatric and mental health nursing* **25** (5-6): 285-296.
- [32] Devilly, Grant J., and Thomas D. Borkovec (2000) "Psychometric properties of the credibility/expectancy questionnaire." *Journal of behavior therapy and experimental psychiatry* **31** (2): 73-86.
- [33] Bohus, Martin, Nikolaus Kleindienst, Matthias F. Limberger, Rolf-Dieter Stieglitz, Melanie Domsalla, Alexander L. Chapman, Regina Steil, Alexandra Philipsen, and Martina Wolf. (2009) "The short version of the Borderline Symptom List (BSL-23): development and initial data on psychometric properties." *Psychopathology* **42** (1): 32-39.
- [34] Black, Donald W., and Nancee Blum. (2017). 'Systems Training for Emotional Predictability and Problem Solving for Borderline Personality Disorder: Implementing STEPPS around the globe' (pp. 181–196). New York, NY: Oxford University Press.
- [35] Keetharuth, Anju Devianee, John Brazier, Janice Connell, Jakob Bue Bjorner, Jill Carlton, Elizabeth Taylor Buck, Thomas Ricketts et al. (2018) "Recovering Quality of Life (ReQoL): a new generic self-reported outcome measure for use with people experiencing mental health difficulties." *The British Journal of Psychiatry* **212** (1): 42-49.

- [36] Clarke, Victoria, Virginia Braun, and Nikki Hayfield. (2015) "Thematic analysis." in Jonathan A. Smith (ed) *Qualitative psychology: A practical guide to research methods*, London, SAGE.
- [37] Wagenmakers, Eric-Jan, Maarten Marsman, Tahira Jamil, Alexander Ly, Josine Verhagen, Jonathon Love, Ravi Selker, Quentin F. Gronau, Martin Šmíra, Sacha Epskamp, Dora Matzke, Jeffrey N. Rouder and Richard D. Morey. (2018) "Bayesian inference for psychology. Part I: Theoretical advantages and practical ramifications." *Psychonomic bulletin & review* **25** (1): 35-57.
- [38] Thiese, Matthew S., Brenden Ronna, and Ulrike Ott (2016). 'P-value interpretations and considerations'. *Journal of Thoracic Disease* **8** (8): 928-931.
- [39] Gelman, Andrew, and Cosma Rohilla Shalizi. (2013) "Philosophy and the practice of Bayesian statistics." *British Journal of Mathematical and Statistical Psychology* **66** (1): 8-38.
- [40] Beard, Emma, Zoltan Dienes, Colin Muirhead, and Robert West. (2016) 'Using Bayes Factors for Testing Hypotheses about Intervention Effectiveness in Addictions Research'. *Addiction (Abingdon, England)* **111** (12): 2230–47.
- [41] Cohen, Jacob. (1988) "Statistical power analysis for the behavioral." *Sciences. Hillsdale (NJ): Lawrence Erlbaum Associates*: 18-74.
- [42] Alavi, Nazanin, Callum Stephenson, and Margo Rivera. (2021) 'Effectiveness of Delivering Dialectical Behavioral Therapy Techniques by Email in Patients With Borderline Personality Disorder: Nonrandomized Controlled Trial'. *JMIR Mental Health* **8** (4): e27308.
- [43] Ferguson, Sandra, and Leeanne Nicklas. (2021) "Supporting Technology Enabled Psychological Therapies and Interventions." *NHS Education for Scotland*. https://www.nes.scot.nhs.uk/media/ud0ijhyo/digital-delivery-guidance-report-final_09-04.pdf
- [44] Becker, Timothy D., and John B. Torous. (2019) 'Recent Developments in Digital Mental Health Interventions for College and University Students'. *Current Treatment Options in Psychiatry* **6** (3): 210–20.
- [45] Webb, Kimberley, Thomas Schröder, and David Mark Gresswell. (2021) 'Grounding Clinical Guidelines in Service Users' Experiences of Endings'. *Mental Health Review Journal* **27** (1): 48–64.
- [46] Bangor, Aaron, Philip Kortum, and James Miller. (2009) "Determining what individual SUS scores mean: Adding an adjective rating scale." *Journal of usability studies* **4** (3): 114-123.
- [47] Rizvi, Shireen L., Linda A Dimeff, Julie Skutch, David Carroll, and Marsha Linehan. (2011) 'A Pilot Study of the DBT Coach: An Interactive Mobile Phone Application for Individuals with Borderline Personality Disorder and Substance Use Disorder'. *Behavior Therapy* **42** (4).
- [48] Frías, Álvaro, Carol Palma, Ana Salvador, Elena Aluco, Sara Navarro, Núria Farriols, Ferrán Aliaga, Laia Solves, and Meritxell Antón. (2021) 'B-RIGHT: Usability and Satisfaction with a Mobile App for Self-Managing Emotional Crises in Patients with Borderline Personality Disorder'. *Australasian Psychiatry* **29** (3): 294–98.
- [49] Kortum, Philip, and Megan Johnson. (2013) 'The Relationship Between Levels of User Experience with a Product and Perceived System Usability'. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* **57** (1): 197–201.
- [50] Klein, Jan Philipp, Andrea Hauer-von Mauschwitz, Thomas Berger, Eva Fassbinder, Johannes Mayer, Stefan Borgwardt, Bernhard Wellhöfer, Ulrich Schweiger, and Gitta Jacob. (2021) 'Effectiveness and Safety of the Adjunctive Use of an Internet-Based Self-Management Intervention for Borderline Personality Disorder in Addition to Care as Usual: Results from a Randomised Controlled Trial'. *BMJ Open* **11** (9): e047771.
- [51] Jacob, Gitta Anne, Andrea Hauer, Sandra Köhne, Nele Assmann, Anja Schaich, Ulrich Schweiger, and Eva Fassbinder. 2018. 'A Schema Therapy-Based EHealth Program for Patients with Borderline Personality Disorder (Priovi): Naturalistic Single-Arm Observational Study'. *JMIR Mental Health* **5** (4): e10983.
- [52] Fassbinder, Eva, Andrea Hauer, Anja Schaich, Ulrich Schweiger, Gitta A. Jacob, and Arnoud Arntz. 2015. 'Integration of E-Health Tools Into Face-to-Face Psychotherapy for Borderline Personality Disorder: A Chance to Close the Gap Between Demand and Supply?'. *Journal of Clinical Psychology* **71** (8): 764–77.
- [53] Bucci, Sandra, Natalie Berry, Rohan Morris, Katherine Berry, Gillian Haddock, Shôn Lewis, and Dawn Edge. 2019. "They Are Not Hard-to-Reach Clients. We Have Just Got Hard-to-Reach Services." Staff Views of Digital Health Tools in Specialist Mental Health Services. *Frontiers in Psychiatry* **10**.
- [54] Kleindienst, Nikolaus, Martin Jungkunz, and Martin Bohus. (2020) 'A Proposed Severity Classification of Borderline Symptoms Using the Borderline Symptom List (BSL-23)'. *Borderline Personality Disorder and Emotion Dysregulation* **7** (11).
- [55] Robinson, Shannon, Jacob E. Lang, Alexandra M. Hernandez, Tracey Holz, Megan Cameron, and Beth Brannon. (2018). 'Outcomes of Dialectical Behavior Therapy Administered by an Interdisciplinary Team'. *Archives of Psychiatric Nursing* **32** (4): 512–16.
- [56] Lakeman, R., M. Emeleus, S. Davies, and S. Anderson. (2021). 'A Pragmatic Evaluation of a High-Fidelity Dialectical Behaviour Therapy Programme for Youth with Borderline Personality Disorder'. *Advances in Mental Health* **19** (2): 116–26.