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Practitioner perspectives on the use of the experience sampling software in counseling and clinical psychology

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ABSTRACT

Facilitating the uptake and making better use of technological advances will be pivotal for counseling and clinical psychology to respond to the rising call for more community-based and person-centred care. While the Experience Sampling Method (ESM), a structured self-report digital diary, could help facilitate this transition, it is currently unclear how practitioners envision using ESM in clinical practice. Therefore, we organised focus groups with 36 mental health practitioners ($M_{age} = 39.37$, $SD_{age} = 12.18$, 58.33% female) across Flanders (Belgium). Four broad topics were discussed: (1) how to use ESM, (2) how to visualise clinically relevant information, (3) the software requirements thereof, and (4) barriers and facilitators for implementing ESM in clinical practice. Thematic analysis was conducted and Cohen's Kappa was calculated ($\kappa = .79$). Different clinical applications emerged, such as screening, evaluating the effectiveness of therapy, and elucidating determinants of mental health problems in daily life. However, practitioners also expressed difficulty determining how to visualise ESM data, and novel features for use emerged (e.g. integration with electronic health records). Various barriers (e.g. lack of best-practice guidelines) and facilitators (e.g. simplicity) were identified, with the implications of these findings for future clinical implementation studies discussed.

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Mental health problems are dynamic experiences that occur in interaction with the environment clients live in on a day-to-day basis (Ebner-Priemer and Trull 2009; Glazebrook and Davies 2018; Bringmann et al. 2017; Myin-Germeys et al. 2018). Understanding these dynamic fluctuations and interactions is crucial for designing and providing person-centred and community-based therapy (Lenaert et al. 2019). In practice, counselors and psychologists, from hereon practitioners, typically assess this using clinical interviews in which clients report retrospectively on their problems and the psychosocial factors that maintain them. While this mode of assessment provides valuable information, it is prone to memory and recall biases. For example, it is well-known that people are likely to recall events congruent with their current mood (Salovey and Singer 1989). Relatedly, it may be challenging for clients to accurately describe the fluctuating and contextual nature of thoughts, feelings, and behaviours (Gard et al. 2007; Myin-Germeys et al. 2018).

One possible way to control the limitations associated with clinical interviews is to use complementary assessment techniques that are less prone to memory and recall biases. One such technique is the Experience Sampling Method (ESM; Csikszentmihalyi, Larson, and Prescott 1977), which is also known as Ecologically Momentary Assessment (EMA). ESM captures and quantifies daily life thoughts, feelings, behaviour, symptoms, and context, and involves randomly prompting individuals to complete a brief questionnaire multiple times a day for several days (e.g. ten questionnaires a day for six consecutive days). As questionnaires are completed 'in the moment', with individuals providing in situ information, ESM minimises memory and recall biases (Verhagen et al. 2016; van Os et al. 2017; Myin-Germeys et al. 2018) and provides rich information on internal and situational determinants of mental health problems as they are lived in daily life (Myin-Germeys et al. 2018). Additional advantages to the use of ESM have been suggested, including: routine outcome monitoring (Hartmann et al. 2015), improving self-insight (Hartmann et al. 2015; Frumkin et al. 2021), increasing therapeutic alliance (Bos et al. 2019; Slade 2017; Tambuyzer, Pieters, and Van Audenhove 2014), and creating real-time interventions based on real-time ESM responses (Rauschenberg et al. 2020). Yet, despite

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ESM's clinical potential, only a few studies have attempted to implement ESM in mental health care (e.g. Bell et al. 2018; Bell et al. 2020; Daniëls et al. 2019; Frumkin et al. 2021) and no long-term implementation has yet been achieved.

1. Clinical implementation of ESM

Implementing and studying the clinical use of ESM fits within the field of human-computer interaction (HCI). In this field, scholars study human interaction with computers to improve the effectiveness of to-be-created or already-existing computer software (Mithun and Yafooz 2018). When developing software, HCI researchers generally use user-centred design approaches in which end-user perspectives are collected and integrated into the implementation process. For example, Molina-Recio et al. (2020) recommend using focus groups with about ten participants to establish expectations, content preferences, and barriers to use.

Few studies have incorporated an HCI approach for the clinical implementation of ESM. Only recently have scholars investigated whether practitioners and clients have an interest in – or have recognition of – clinical potential for ESM (i.e. a prerequisite for potential use). For example, Bos et al. (2019) conducted focus groups with 22 clients and 21 practitioners. They found that clients and practitioners consider collected ESM data to offer increased reliability next to more traditional assessment methods. They also found preliminary evidence for other potential clinical benefits of ESM, such as personalising interventions, creating emotional self-awareness, enhancing self-insight, increasing self-management, and being able to provide real-time feedback. Similarly, Frumkin et al. (2021) recently found that both clients and practitioners perceive ESM as useful for therapy as it may improve clients' self-awareness and help practitioners understand clients better.

While the works from Bos et al. (2019) and Frumkin et al. (2021) show *clinical interest* in using ESM, they do not address how practitioners *intend to use* ESM in clinical practice. The differentiation between interest and intent is essential as it has consequences for the format of ESM. For example, using ESM for treatment monitoring may require different data analyses and visualisation techniques compared to using ESM for a baseline assessment. Following a user-centric design approach, an important next step may be to investigate end-user demands on ESM content before its development and implementation (Molina-Recio et al. 2020). However, existing implementation attempts utilised ESM content developed for research and directly transferred it to the clinic (e.g. Bastiaansen et al. 2018; Bell et al. 2020; Daniëls et al. 2019; Frumkin et al. 2021), which might be a critical reason for the low clinical uptake of ESM; the implemented content might not fit the workflow of practitioners (Bos et al. 2019; Ellison 2020). Hence, future implementation efforts will advance better and more rapidly when end-user perspectives are considered prior to development and implementation testing.

Given that ESM has primarily been used within a research context, ESM software fits the needs of researchers (e.g. Rough and Quigley 2015). However, an important question to address is whether research-focused software also fits the needs of practitioners (Bos et al. 2019; Ellison 2020). For example, it becomes apparent that current software offers a wide range of content design features (e.g. multiple-choice questions, slider questions, open questions, branching) but provides limited features for data analysis and visualisation (Weermeijer, Kiekens, and Wampers 2022). This may be because research data are often analyzed and visualised externally through statistical programming (e.g. with R or Python). However, in the clinic, practitioners may lack the skills or time to process and visualise data with statistical programming. Therefore, prior research has suggested that custom data analysis and visualisation features for clinical use are required (Weermeijer, Kiekens, and Wampers 2022). However, what encompasses desired data analysis and visualization is currently unclear. Similarly, as most tools are developed for research, practitioners have not been involved in the software development process. This might be problematic as a lack of practitioner involvement is often suggested as a crucial reason for the implementation failure of digital technologies for mental healthcare (Griffin et al. 2019). Therefore, studying practitioner perspectives on data analysis, data visualisation, and software requirements may be valuable.

An important reason to consider relates to experienced barriers from the practitioner's point of view. For example, van Olmen et al. (2020) argue that effective innovations fail to integrate into real-life workflows due to experienced barriers or hesitation. In the current literature, some hints at such barriers have been identified, with the most prominent being: burden, concerns for iatrogenic effects, and software complexity. For instance, it was found that some practitioners are concerned about the high assessment frequency (Bos et al. 2019; Frumkin et al. 2021) and the potential worsening of symptoms (Bos et al. 2019). Relatedly, Ellison (2021) conducted a survey study on practitioners' interest in ESM compared to traditional assessment techniques, finding that while optimistic about its potential, practitioners do not favour it over conventional methods. Ellison argued this might

be because ESM is a rather new tool with a relatively small evidence base compared to traditional methods. Additionally, in one recent implementation study, practitioners felt unable to use current ESM software as they lacked the necessary skills to make use of its potential (Daniëls et al. 2019). Finally, and equally crucial to studying what withholds practitioners from using ESM, concerns facilitators of clinical use. For instance, Gagnon and colleagues (2016) identified 40 facilitators for using digital technologies in health care more broadly, with essential and frequently recurring facilitators being perceived usefulness, ease of use, interoperability with other systems, and management support.

To this end, the present study investigates (a) the clinical purposes for which practitioners want to use ESM, (b) how they would want to analyze and visualise relevant information, (c) its software requirements, and (d) the potential barriers and facilitators for use. These four ESM content domains are explored through a series of focus groups.

2. Method

2.1. Participants and procedure

Four Focus Groups were organised with mental health practitioners from four different institutions across Flanders (Belgium). We decided on a focus group format to investigate how mental health practitioners, as a cohort, envision the clinical application of ESM. The study was advertised on social media, and snowball sampling was employed to recruit a minimum of 30 mental health practitioners. There were minimally six and maximally 12 practitioners involved in each focus group. The sample size and the number of focus groups were determined based on existing work, which recommends four focus groups – with minimally six and maximally twelve participants each – to achieve over 90% data saturation (Hennink, Kaiser, and Weber 2019; Tang and Davis 1995). No financial remuneration was provided to participants.

The first author moderated all focus groups together with a co-moderator. A member of the research team took up the co-moderator role in every focus group. Before the start of the focus group, a brief introductory presentation (circa. 15–20 min) was provided, which covered fundamental aspects of ESM such as questionnaire content, sampling schemes, and clinically relevant examples (e.g. Myin-Germeys et al. 2009; Wichers et al. 2011). After the presentation, practitioners could ask questions to the research team and were requested to complete a demographic questionnaire.

During each focus group, four broad topics were discussed. The first topic explored the use of ESM in clinical practice. Second, practitioners were provided with several data visualisation examples from previous clinical research studies (i.e. Hartmann et al. 2015; Bell et al. 2018; van Os et al. 2017; Wichers et al. 2011; Van Roekel et al. 2017; Voigt et al. 2018; Blaauw et al. 2017), after which visualisation of data was discussed. Third, practitioners discussed and shared perspectives on software requirements for clinical use. Finally, potential barriers and facilitators of integrating ESM in clinical practice were discussed. Focus groups lasted between 100 and 120 min, were recorded with two recorders (Sony ICD-PX240), and transcribed verbatim by two independent researchers. At the end of the focus group, practitioners were also asked to complete a brief feedback questionnaire informing us whether they would use ESM in their clinic. All participants provided written informed consent, and the University's Ethical Review Board approved the study's protocol.

3. Data analysis

Analysis was conducted using NVivo 12 PRO (QSR International Pty Ltd.,) and was based on the reflexive approach to thematic analysis outlined by Braun and Clarke (2006). This method of analysis involves several consecutive steps. First, the researchers familiarise themselves with the data by (re)reading the transcripts. Second, codes are generated with a few words based on segments of cohesive sentences. Third, overarching themes are then defined based on the generated codes. Next, an extensive theme review is conducted on the developed themes. Afterwards, the emerging themes are refined. Finally, compelling quotes are selected to illustrate the different (sub)themes. Additionally, we checked the analysis's reliability by including a second coder, who coded 20% of the segments (selected at random). For each of these segments, we compared the labels of both coders and evaluated whether labels matched and whether there was disagreement in the overarching themes. We used Cohen's Kappa to express the percentage of agreement between the two coders. This study was not pre-registered and followed APA Ethical Principles.

4. Results

4.1. Participants

Thirty-six mental health practitioners ($M_{age} = 39.37$, $SD_{age} = 12.18$, 58.33% females) participated in this study, including twenty psychologists, nine psychiatrists, and seven other mental health

professionals (i.e. psychotherapist, psychomotor therapist, a mental health consultant, psychiatry resident, psychology resident, and two team coordinators). Line of work differed between practitioners, including psychodiagnostics, cognitive behavioural therapy, family counseling, attachment-based family therapy, emergency care, and neuromodulation. Participating practitioners were part of one of four focus groups. The group size of the consecutive focus groups concerned 8, 9, 7, and 12, respectively – in line with suggested minima and maxima (i.e. six to twelve; Hennink, Kaiser, and Weber 2019; Tang and Davis 1995). When presented with the feedback questionnaire at the end of each focus group, twenty-one practitioners (58.33%) indicated they would use ESM. Eleven clinicians (30.55%) indicated they might use it, one clinician (2.77%) was not interested in using ESM, and three clinicians (8.33%) did not answer the question on the feedback questionnaire.

4.2. Thematic analysis

The original transcripts were reread multiple times and were subsequently divided into unique segments by the first author. Each segment contained a series of cohesive sentences. The first author then labeled and iteratively grouped the different segments into overarching themes. Generated themes were reviewed and refined with co-authors until an agreement was reached, leaving nine themes as a result. A second coder subsequently and independently labeled 20% of the transcript segments. Afterward, their labels were compared with those of the first author, and it was evaluated whether they matched the nine themes identified. For this, Cohen's Kappa was equal to .79. Figure 1 provides an overview of identified themes per discussed topic. Representative quotes for each theme are provided in table 1 and labeled as q1-q36 in the text.

4.2.1. Topic 1: application of ESM

Practitioners were generally interested in using ESM software in their clinical practice and mentioned that it could digitalise existing tools such as paper-and-pencil diaries (q1). In addition, they showed interest in ESM as a complimentary tool (q2). When asked how this interest would translate into actual use, the practitioners stressed interactive use with clients. For example, they discussed setting up questionnaires together and discussing relevant information during therapy. However, practitioners' attitudes varied on the clinical application purpose of ESM.

A first application that practitioners envisioned was using ESM descriptively as an observational tool to assess a client's mental health or symptoms over time (e.g. to assess mood fluctuations over time, q3). Related to this, practitioners mentioned they could use such a tool to screen individuals (q4), or even monitor them throughout care to evaluate treatment effectiveness (q5). A third, more complex, application practitioners considered was using ESM to generate clinical hypotheses. For example, they mentioned that ESM might help them gain insight into the contextual determinants of mental health problems as it would allow collecting information on the contextual determinants of mental health symptoms (q6). Building on this, a final application concerned providing digital interventions based on real-time data (e.g. feedback when a client reported being in distress). However, in one focus group, practitioners raised concerns about interventions when they would directly follow the occurrence of a mental health problem. They argued that immediately intervening could cause clients to become dependent on the ESM software and indicated that interventions that would be offered only after a minimum time interval (q7), could potentially mitigate this dependency.

4.2.2. Topic 2: visualisations of ESM data for clinical use

The next topic considered the visualisation of ESM data for clinical use. Overall, practitioners expressed difficulty in determining fixed requirements for visualisations. For instance, practitioners agreed it would depend on the purpose ESM is being used for (q8) and what clients can understand (q9). However, when presented with examples, practitioners did consider several types of visualisations clinically meaningful, including time series in which therapists can see how a relevant psychological outcome (e.g. positive or negative affect) fluctuates over time, bar charts that show how individuals experience different emotions in different contexts, and pie charts that show how often individuals engage in certain (social) activities.

Two types of visualisations on which opinions were mixed included network diagrams and pictograms. In a network diagram, lagged (auto)correlations between variables of interest are plotted as arrows, making it possible to study predictive relationships over time between moods, thoughts, and behaviour. However, some practitioners were concerned about the complexity and validity of these diagrams (q10), while others believed they could be meaningful if they are intuitive to interpret and/or sufficient empirical support is provided. Concerning pictograms, practitioners referred to the use of smileys or images to depict mood states. Some practitioners considered this useful to display data in an intuitive and easy-to-interpret manner

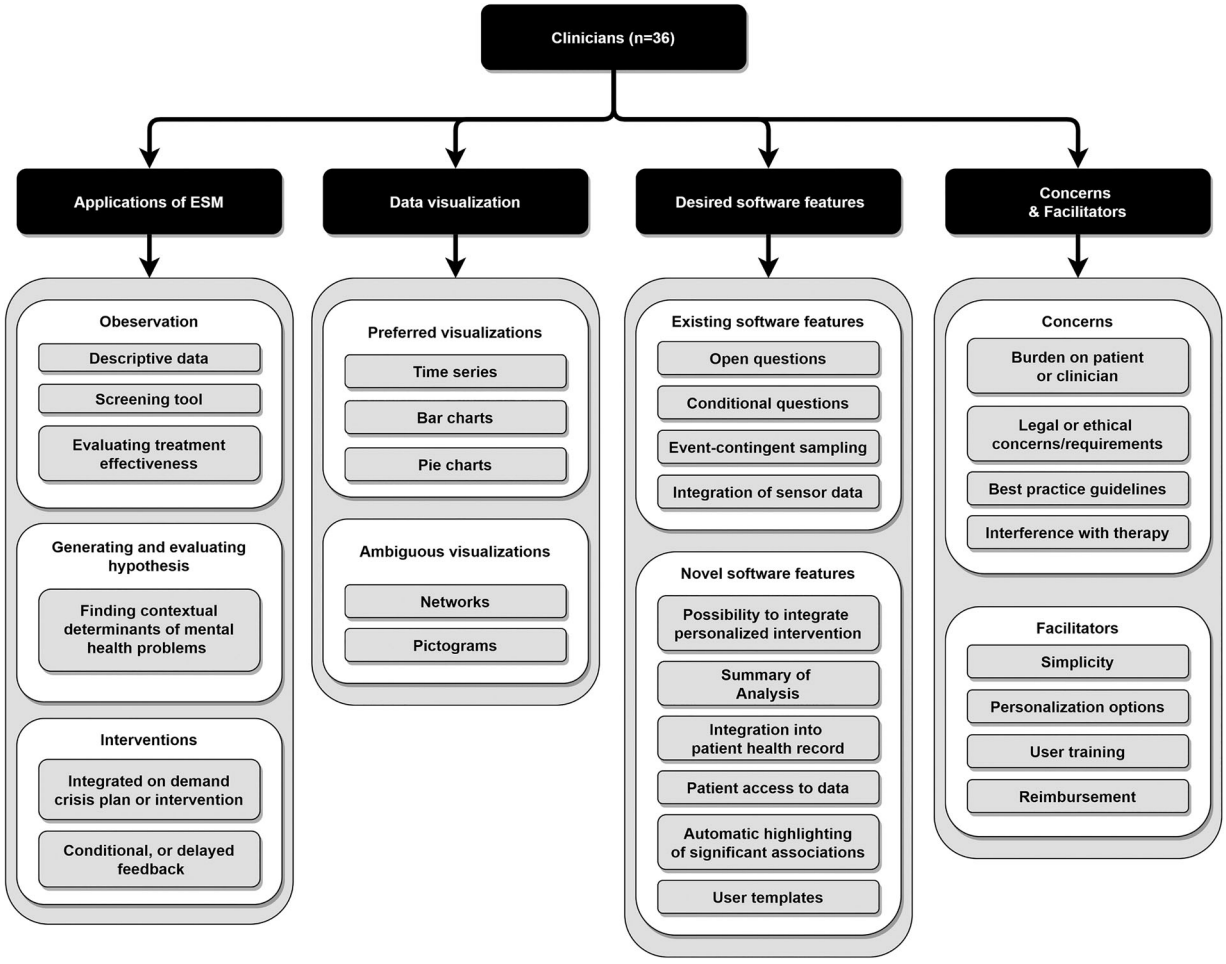


Figure 1. Thematic analysis results.

(q11), while others mentioned it might infantilize a client (q12).

4.2.3. Topic 3: desired software features for clinical applications

Next, practitioners discussed and shared perspectives on desired software features for clinical applications of an ESM tool, expressing wishes for several features that are currently possible such as creating open questions and conditional branching in which questions are asked conditionally on the response of a previous question. Similarly, it was mentioned multiple times that an event-contingent feature would be clinically valuable. This could concern instances in which questionnaires or interventions are only accessible to clients based on a specific event (q13). Furthermore, some practitioners envisioned integrating sensor data from wearables. For example, it was mentioned that the data collected passively from a smartphone (e.g. location) could be combined with responses from questionnaires to accommodate their envisioned use of ESM (q14). How this data would be used was, however, not discussed further.

Contrasting the overlap with existing features, practitioners also discussed several features not yet possible with most ESM software. This included the possibility of integrating a personal intervention such as an individual crisis plan for times of high emotional distress (q15), and a personalised data feedback report that could be integrated into existing electronic client health records (q16). Correspondingly, some practitioners also suggested that providing clients with direct access to the visualisations would be valuable. For instance, practitioners indicated that it would be helpful to incorporate automatic highlighting of relevant clinical associations. Finally, in one focus group, the idea of using 'templates' was introduced, which practitioners envisioned as a set of different ESM paradigms (i.e. differing in content/sampling rating) that could easily be selected depending on the client's needs and profile (q17), essentially removing the requirement to recreate content from scratch for each individual client.

Table 1. Selected clinicians quotes.

Topic	Quote*
Applications of ESM	
	q1: 'I still use paper and pencil methods when studying bipolar disorder, mood, and pain. I think it would be an interesting exercise to see which of those could be digitalised using ESM and how we could visualise this data, because paper and pencil is just paper and pencil'.
	q3: 'In psychodiagnostics we often work with self-reports and we are starting to have second thoughts because you only get a single measurement point, it doesn't tell us anything about functioning in everyday life. I would 100% be in favour of using ESM. We have to try and evaluate whether it is fit to use within our patient populations. I would definitely integrate it'.
	q3: 'I believe that here, in our ward, we often deal with chronic cases. If I can investigate the link between mood and time of day, that would already be very interesting'.
	q4: 'What about someone who is not in therapy.. someone who is just curious on how it (ESM) works? < … > And maybe that this data can help someone reflect, and maybe it can also help such an individual to seek out care. < … >'
	q5: 'I think ESM can provide a lot of insight into dynamics of psychopathology, but we don't simply want to know 'Where do symptoms originate from?'. We also want to help the patient and answer questions such as 'How are we dealing with symptoms?' and 'What can we learn?'. What I would find helpful is for instance if a patient would get an ESM questionnaire on the effect of treatment, and then use this information to start of a face-to-face session'.
	q6: 'I think this is a very interesting instrument for patients < … >. I would be interested in visualising how they function in various contexts. In such a way that they can see in which contexts they experience the least symptoms < … > I also work with chronic patients, who have had an abundance of therapy where I often wonder if it's not simply better to investigate exposure to novel contexts'.
	q7: 'I think that immediacy of real-time feedback is a very important topic to address. I believe it should not be immediate'.
Data visualisation	
	q8: 'Hmm, for me it depends on what I am measuring or what I want to investigate. Which visualisation is most interesting.. to.. provide as feedback? I find it difficult to answer that question with just one type of visualisation'.
	Q9: 'I would start with easy visualisations and in function of what the client understands, I would also introduce the more complex figures [networks] as long as they [clients] can understand it as well'.
	Q10: 'I think that visualisation needs to be easy to understand. I am thinking pie charts and timeseries can be used as they are easy to interpret. However, the network graphs are hard to interpret and those would need to be simplified'.
	q11: 'I sometimes see adolescents in my private practice, and giving words to feelings is sometimes not that evident. I would use … pictograms < … >'.
	q12: 'We should be careful not to infantilize things. The use of pictograms? I think it is important to question whether the use of them is appropriate when we are for instance dealing with severe psychopathology. You need to be careful … it is important to stay serious'.
Desired software features	
	q13: 'It's easy to just ask 1 question 'how are you?' and then if the person answers less than 20 out of 100, or something like that, then you initiate a whole action plan'.
	q14: 'A different, kind of futuristic, perspective is for instance the possibility to pair ESM to sensor data collected with a smartwatch or phone < … >. To include those elements would be interesting, but I think that would require complex algorithms and probably collaboration with those who make those wearables'.
	q15: 'I think it would be interesting to create it [the setup of a crisis plan] individually. < … > I would together with them decide on when and how to trigger the crisis plan. That would definitely be useful. < … >'
	q16: 'I would rather have it [ESM data visualisation] integrated into the electronic client health file system as opposed to us having to use alternative software < … >'.
	q17: 'I was thinking of those templates that exist in Microsoft Word < … >. If you could make templates like that in the ESM software, that would be interesting. That there are templates for different therapeutic approaches < … >'.
Concerns and facilitators for use	
	q18: 'If it's just a replication of what we already do clinically, that it offers no extra information or surplus … then it nice to have, but not needed'.
	q19: 'I work with a particular group of clients who would quickly learn how to use this tool such that they get extra care. They would turn it into a game < … >'.
	Q20: 'I am thinking of my professional confidentiality. We can collect data on abuse, suicidality, aggression. It is registered, what if something happens < … > to what degree can someone take a screenshot, and what would the legal implications be if there is an investigation?'
	q21: 'I would like to see a proof-of-concept. Right now, I cannot decide whether I would use it. It needs to be user-friendly and simple. If this is not the case, I would not use it with my clients'.
	q22: 'I think personalisation is very important. That you can discuss with your client how a question is asked. For instance, instead of a 'now do this' type of message, I would want to provide a 'remember when we did this in therapy … ' type of message. I also hate the word 'automized', I think it would have a negative effect if my client would feel the questions are generic'.
	q23: 'I believe that a formal training would be useful. This because of all the things we discussed: which clients to use it with, how to use it, how to interpret data, how to communicate data, how to integrate it into a dialogue, how to get an added benefit out of it < … > I think that there are risks < … > we need formal training if we are to use it'.
	q24: 'It is unlikely to be used if it does not provide a significant health gain or if invested time is not reimbursement'.

*Quotes have been translated from Dutch and edited to improve comprehension

4.2.4. Topic 4: Concerns and facilitators for use

Several concerns were identified that may prevent the uptake of ESM into clinical practice. First, practitioners reported that ESM needs to provide complementary information to justify its use, so it is not perceived as an additional burden (q18). Similarly, some practitioners were concerned that ESM might interfere with the therapeutic process through incorrect or

misleading use of information. For example, it was mentioned that some clients might fill out questionnaires in such a way that they are ensured to receive additional care (q19). Third, practitioners expressed concern about liability and data privacy and indicated uncertainty of the implications of data leaks (q20). Fourth, some practitioners stated that the lack of evidence regarding clinical effectiveness would withhold ESM's use in their practice.

Conversely, several facilitators for use were identified as well. Most importantly, clinicians mentioned that they would like to see proof-of-concept, indicating that they would use ESM if the software is user-friendly and simple to use (q21). In addition, practitioners mentioned that flexibility in terms of content personalisation is clinically important and could facilitate uptake. For example, practitioners mentioned that it would be valuable to create client-specific content that relates back to skills or problems identified in therapy (q22). Relatedly, practitioners suggested training would be helpful because all different aspects of ESM (i.e. sampling rate, developing a question, length of the questionnaire, interpreting data visualisations, etc.) may make it difficult to perceive an added benefit (q23). Finally, some practitioners expressed that financial reimbursement for time to learn and use ESM would facilitate uptake (q24).

5. Discussion

This qualitative study explored how mental health practitioners envision using ESM in mental health care. Several interesting findings emerged. Most practitioners viewed ESM as a potentially helpful tool to implement clinically, and different applications of ESM were suggested. However, there was considerably less consensus on how ESM data should be visualised to be clinically useful. Our findings also revealed several barriers that should be addressed and particular facilitators that could help implement and uptake ESM into clinical practice. In what follows, we reflect on each of these findings.

The present findings show that practitioners foresee multiple practical applications of how they can use ESM to enhance their therapeutic services (e.g. objective data for screening, observation, theory forming, testing, creating interventions, and evaluation of treatment). This adds to the existing body of work that has demonstrated that practitioners recognise researcher-proposed advantages of ESM (Bos et al. 2019; Frumkin et al. 2021; Ellison 2020), such as ESM providing objective data on daily-life experiences, capturing emotional variability, identifying situational determinants of mental health problems, and offering new avenues for intervention (Myin-Germeys et al. 2018). Whereas prior work focused on identifying these advantages, it is encouraging to see practitioners envision applying ESM as a tool in ways congruent with these clinical benefits.

Crucial to highlight is that the we envisioned the use of ESM in terms of therapeutic enhancement as opposed to ESM being used as a self-monitoring tool – independent of therapy – to improve self-management or self-care. This implies that practitioners did not have to consider ESM as a mental health product with intrinsic value, but instead what Mohr et al. (2017) call a 'technology-enabled service' (TES). A TES is a digital technology that enhances or enables access to a (mental health) service and differs from a mental health product, in which the product is the solution. Importantly, our results illustrate that ESM has multiple application purposes when considered as a TES. For multiple application purposes, it may be necessary to focus on one specific application at a time during implementation (Graham et al. 2020). For instance, ESM could be used to evaluate hypotheses in psychodiagnostic assessments, monitor and screen variability of affective states, and evaluate treatment effectiveness in daily life. This contrasts with current implementation attempts in which ESM is implemented without focusing on enhancing a particular goal of a mental health service. Hence, it would be worthwhile for future implementation attempts to focus on developing ESM software for specific application purposes. However, this might be challenging as different application purposes may require different ESM formats (i.e. sampling frequency, content, and data visualisation options). For example, to identify contextual determinants of a mental health problem, a single week of ESM may be set up with content focusing on a symptom of interest (e.g. irregular mood variability; aan het Rot, Hogenelst, and Schoevers 2012) and measures of context (e.g. social environment, engaged activity). Then, as a means of visualisation, a network graph may be used to identify contextual determinants of the symptom of interest. Contrastingly, if the purpose is to assess the treatment effectiveness of medication and/or therapy, a single week may not suffice, and periodic sampling may be more appropriate (e.g. multiple weeks of ESM tracking changes in the symptoms of interest). Speculatively in this case, a bar chart comparing average symptom intensity of variability per week may be a better visualisation choice than a network graph. Again, however, what will work best is yet to be determined in further implementation research. Hence, for developers, it will be important to develop ESM software that can be used flexibly (e.g. allow changes in how often should be sampled, what the

content of the ESM questionnaire should be, and how data can be visualised).

In a similar vein, we found that practitioners expressed difficulty in determining how to visualise ESM data, stating that this would depend on the particular clinical application for which ESM was being applied. These findings may help explain why the added value of previous ESM data visualisations has been questioned by practitioners in some studies (Frumkin et al. 2021; Zimmermann et al. 2019), as it may not always be straightforward to perceive the added value of general visualisations without a precise application. Hence, a way forward might be to develop guidelines on how data visualisations can be best used in therapy for different applications. The need for such guidelines becomes especially relevant considering that the interpretation of data visualisations can be subject to cognitive biases (Mansoor and Harrison 2018). For example, Correll and Gleicher (2014), showed that visualising mean and standard deviations using a bar chart *with* error bars resulted in individuals making overestimations of the effect size.

Another critical finding considers the desired features that are currently unavailable with most ESM software tools, including being able to provide clients access to data and the ability to integrate ESM data into patient health records. Several companies have started development work on integrating data from third-party applications into patient health records (Dinh-Le et al. 2019). However, this is a challenging endeavour as local institutional and legal considerations must be considered. Additional features that are not readily available include integrating personalised interventions, a summary report of the analysis, automatic highlighting of clinically relevant associations, and using templates with predefined content. While these features will require additional development work, they also require consensus on what interventions can be provided, when, what type of information is clinically relevant to report, and how this should be analyzed. Currently, such consensus is lacking in the field. For example, Byambasuren et al. (2020) recently provided twelve independent ESM research teams with an ESM dataset to identify a therapeutic target. Despite working with the same information, subjective analytical choices led each team to a different therapeutic target, demonstrating that, even within expert groups, no consensus exists on best practices to analyze ESM data to identify a therapeutic target.

Finally, we identified several barriers and facilitators that may influence the uptake of ESM. Barriers included burden, legal or ethical concerns, lack of best practice guidelines, and undesired inference with therapy. These findings support Bos et al. (2019), who found that practitioners fear self-monitoring may provide clients with continuous exposure to their mental health problems, which might be emotionally taxing. Furthermore, while Bos et al. (2019) and Ellison (2021) also addressed the lack of best practice guidelines, concerns surrounding data privacy for ESM have been less commonly reported. However, Zakerabasali et al. (2021) found that data security and privacy concerns are among the most prevalent concerns of practitioners regarding the use of emerging technologies in mental health care. Finally, we identified several facilitators, including the software's simplicity, the possibility for personalisation, the need for user training, and reimbursement for (learning to) use ESM. These facilitators largely match previous findings. For instance, the finding that ESM software should be easy to use is a facilitator identified in other implementation work on mental health applications (Gagnon and colleagues 2016). The facilitators 'possibility for personalisation' and 'need for user training' also align with recent findings, indicating that personalised messaging and training are key to stimulating use (Fuller-Tyszkiewicz et al. 2018; Piot et al. 2022). Finally, the 'reimbursement for (learning to) use ESM' facilitator is novel and may suggest that practitioners consider ESM as additional labour instead of an integral part of their therapeutic services. This implies that future implementation work must develop strategies that promote ESM as an add-on tool to therapy that carries significant potential for improving mental healthcare.

6. Limitations

While the present study provides novel insights into practitioner perspectives on the actual use of ESM, some limitations should be considered when interpreting the findings. First, practitioners in our focus groups considered using ESM based on examples rather than having actually used ESM. Therefore, the next step for future research is to evaluate practitioners' perspectives after using ESM. Second, we chose to focus on practitioners and did not include the perspective of clients. This decision was made because we considered it meaningful to first answer how practitioners envision using ESM. However, this implies that future work is needed to evaluate whether the findings obtained here match clients' perspectives. For example, some populations (e.g. Parkinson's disease; Vega et al. 2018) may prefer completing ESM assessments using paper-and-pencil diaries, of which the results can be scanned and processed using specific software. Third, practitioners considered different clinical applications of ESM, yet we do

not offer a fine-grained exploration of these specific applications – which, guided by the present findings, forms an important research direction for future studies. Fifth, additional barriers and facilitators may exist beyond the topics discussed in our focus groups. For example, Van Berkel et al. (2017) demonstrate that gamification can improve the user experience of individuals completing ESM assessments. Finally, it remains to be investigated whether the findings discussed here can be generalised as the majority of included clinicians in our study appeared were interested in using ESM.

7. Conclusion

This study went beyond merely exploring the potential clinical benefit of using ESM by investigating how clinicians envision applying ESM in practice. We found that mental health practitioners consider several application purposes regarding the use of ESM in their clinical work, but also express a need for guidelines tailored to specific applications to ensure successful uptake. Perhaps the most important finding from this study is that clinicians do not perceive ESM as a 'one-size fits all tool', which illustrates the need for future work to accommodate the desired features and match specific application purposes. Current ESM software requires additional work, and guidelines are required on what constitutes best practices for the clinical use of ESM. Finally, we identified barriers and facilitators that should be considered in future implementation research. The findings of our study illustrate that we will only be able to leverage ESM as a research instrument into a clinically meaningful tool by considering end-user perspectives.

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