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A Specialised Antenatal Music Therapy (SAMT) programme for pregnant women with mental health conditions: A mixed-methods proof-of-concept study in Ireland

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ABSTRACT

Introduction: Perinatal mental health has a long-term impact on maternal and infant well-being. Non-pharmacological treatment options are needed for pregnant women and emerging evidence has shown the potential of music therapy to improve perinatal mental health and antenatal attachment. However, research is lacking on individual music therapy for pregnant women with mental health conditions and formal music therapy services are currently absent within perinatal mental health care in Ireland. This mixed-methods, proof-of-concept study aimed to assess the feasibility and preliminary evidence on the effectiveness of a specialised antenatal music therapy (SAMT) programme for pregnant women attending the Specialist Perinatal Mental Health Service (SPMHS).


Method: Pregnant women between 25 and 33 weeks gestation with various mental health conditions were recruited through the SPMHS to receive six in-person or online sessions of SAMT. Feasibility outcomes included retention, adherence, and fidelity. Assessment of participants' wellbeing, anxiety, and antenatal attachment were conducted before and after SAMT and each session. Semi-structured interviews were conducted and analysed using thematic analysis.


Results: Twelve pregnant women were included and nine completed SAMT and assessments, demonstrating a 75% retention rate. High levels of adherence and fidelity were reported. Significant improvements were observed in participants' wellbeing, anxiety levels, and antenatal attachment. Qualitative findings highlighted the therapeutic benefits, the accessibility and challenges of the online setting, distinctive therapeutic experiences, and participants' recommendations.

Discussion: The findings suggest implementing SAMT within the Irish SPMHS is feasible and beneficial. The study offers insights into the therapeutic mechanisms of SAMT and supports the progression to a larger trial.

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KEYWORDS Music therapy; perinatal mental health; maternity; women's health; pregnancy

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Introduction

Perinatal mental health typically refers to the mental health of individuals during pregnancy and the first year postpartum (Howard & Khalifeh, 2020). According to the World Health Organization (2022), one in five women experience a mental health condition during the perinatal period, with maternal suicide a leading cause of maternal deaths (Katherine et al., 2022). This risk of perinatal mental health complications is heightened for women with a history of mental health diagnoses, due to pregnancy-related stress, medication discontinuation, and the potential onset of mental illness during pregnancy (Filippetti et al., 2022). Untreated perinatal mental health conditions are a significant public health concern as they can have long-term negative impacts on women and their offspring that can result in significant costs to society. For example, in the UK, the total lifetime costs associated with perinatal depression and anxiety were estimated at £75,728 and £34,811, respectively, with 72% of these costs related to the long-term development and mental and physical well-being of the offspring (Bauer et al., 2016). Promoting perinatal mental health through prevention, early intervention, and treatment strategies is a global priority (McNab et al., 2022).

International research increasingly highlights the therapeutic effects of music on perinatal mental health, particularly its benefits during pregnancy (Ji et al., 2024; Konsam et al., 2023; Sanfilippo et al., 2021). Music interventions have been shown to effectively reduce anxiety (Lin et al., 2019), lower blood pressure and pregnancy-induced hypertension (Cao et al., 2016; Yüksekol & Başer, 2020), and improve sleep quality during pregnancy (Sanlı et al., 2022). Maternal singing during pregnancy has also been shown to improve maternal wellbeing and mother–infant bonding (Persico et al., 2017; Wulff et al., 2021). Moreover, antenatal music engagement correlates with more positive birth experiences, including shorter labour duration, greater likelihood of labour starting naturally, and less reliance on medication (García González et al., 2018). It is also associated with better postnatal maternal well-being with reduced symptoms of anxiety and depression (Fancourt & Perkins, 2018) and improved postnatal attachment (Persico et al., 2017). Infants exposed to music in the womb have scored significantly higher on five clusters of the Brazelton Neonatal Behavioural Assessment Scale including habituation, orientation, range of state, regulation of state, and autonomic stability (Arya et al., 2012). Exposure to music in the womb has been associated with positive long-term effects on neonatal brain development (Partanen et al., 2013).

Antenatal music therapy involves the clinical use of music by a credentialed music therapist to accomplish individualised goals within a therapeutic relationship. Documented practice includes bedside care for hospitalised pregnant women (Bauer et al., 2010; Corey et al., 2019; Horn et al., 2022; Teckenberg-Jansson et al., 2019; Winslow, 1986), group programmes (Carvalho et al., 2021; Federico, 2005; Friedman et al., 2010), and home/family-based therapy (Lander, 2017). In these music therapy programmes, both receptive and active music therapy methods were often offered and employed in combination. Specialised techniques have also been devised such as creating birthing playlists (Cheung & McCaffrey, 2022), singing lullabies (Friedman et al., 2010), and writing a welcome song (Carvalho et al., 2021; O'Reilly et al., 2023).

The reported benefits of antenatal music therapy include the reduction of pregnancy-related distress (Bauer et al., 2010; Horn et al., 2022), offering a space to relax (Corey et al., 2019) and a medium for emotion processing and release (Friedman et al., 2010; Horn et al., 2022). It also helped normalise and enhance the hospital experience (Corey et al., 2019; Horn et al., 2022), equipped women with new resources (Corey et al., 2019; Horn et al., 2022), fostered mother-foetal bonding and connection with family (Horn et al., 2022; Lander, 2017; O'Reilly et al., 2023).

Despite growing interest, there remains a significant research gap in the field of music therapy for perinatal mental health. While most studies focus on music listening during pregnancy, few explore music therapy, and antenatal music therapy studies often lack evaluations of their effectiveness (Ji et al., 2024). Furthermore, research specifically on individual music therapy for pregnant women with mental health conditions is lacking. As this field develops, rigorous research is crucial to validate the efficacy of antenatal music therapy and establish evidence-based practices. A proof of concept (PoC) study is necessary to provide initial evidence of a programme's efficacy in a small, selected group of individuals and offer the confidence needed to progress to later studies (Colin & Smith, 2019; Kilcoyne et al., 2013). Thus, this study was designed to evaluate a Specialised Antenatal Music Therapy (SAMT) programme, with three objectives: (a) to examine the feasibility of implementing SAMT in an outpatient perinatal mental health service; (b) to gather preliminary evidence on the effectiveness of SAMT in improving well-being, reducing anxiety, and promoting antenatal attachment among pregnant women; and (c) to identify essential components of SAMT.

Method

Design

This study adopted a convergent mixed methods design, which involved the simultaneous collection, analysis, and integration of both qualitative and quantitative data. This design enabled a comprehensive examination of the feasibility, initial efficacy, and mechanisms of action of SAMT. Further details are described below, and the flow of the study design is displayed in Figure 1. This study is reported following the guidelines for publishing mixed methods research (Bradt, 2015; Creswell et al., 2011).

Setting and participants

The study was conducted at a regional Specialist Perinatal Mental Health Service (SPMHS) outpatient clinic in the Republic of Ireland from June 2021 to June 2022 during the COVID-19 pandemic. The clinic provided care to patients referred by other healthcare professionals (e.g. GPs, obstetricians, midwives) for moderate to severe presentation of mental health conditions, including perinatal mood and anxiety disorders such as pregnancy-related anxiety and tokophobia (fear of childbirth)¹ (Kitamura et al., 2024).

¹Tokophobia refers to the intense fear of pregnancy and childbirth. It can occur in individuals who have never experienced childbirth (primary tokophobia) or in those who have previously experienced pregnancy loss or a traumatic birthing experience (secondary tokophobia). Kitamura, T., Takegata, M., Usui, Y., Ohashi, Y., Sohma, S., Takeda, J., Saito, T., Kasai, Y., Watanabe, H., Haruna, M., & Takeda, S. (2024). Tokophobia: Psychopathology and diagnostic consideration of ten cases. *Healthcare*, 12(5), 519. <https://www.mdpi.com/2227-9032/12/5/519>.

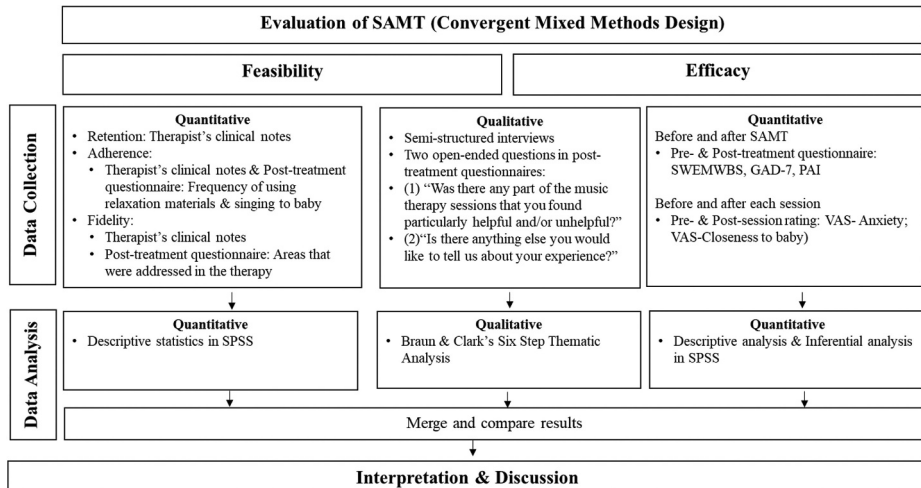


Figure 1. Diagram of the study design (convergent mixed-methods design)

Participants were recruited using purposive sampling (Robinson, 2014). Potential participants were referred to music therapy by psychiatrists, midwives, mental health nurses, and the social workers of SPMHS. Eligibility criteria for participation required women to be over 18, proficient in English, have exhibited mental health conditions and be attending SPMHS. Women also needed to be between 25 and 33 weeks gestation when they commenced SAMT, as research has shown that foetuses respond to maternal acoustic stimulation at around week 25 (Ferrari et al., 2016) and the 33-week limit was set to ensure completion of the six-week programme before delivery. Participants were excluded if they received other forms of psychosocial intervention (such as talking therapy or support group) or experienced obstetric complications and were deemed unsuitable for the study by the consultant psychiatrist.

Eligible women were referred using a referral form detailing participants' demographics, relevant medical history, and preferred delivery mode of SAMT (in-person or online). Upon receiving the referral forms, the music therapist (who was the lead researcher of this study and was part of the SPMHS team during the study period) contacted the women via phone to explain what participation in SAMT entailed. Interested participants were then emailed the study information sheet and consent forms. After obtaining consent, the music therapist invited the participants to complete pre-programme questionnaires on Qualtrics and scheduled SAMT sessions at their convenience.

Ethical considerations

Ethical approval for the study was obtained from the Health Service Executive Mid-Western Area Research Ethics Committee (Reference: 070/202). Participants were explicitly assured of anonymity, confidentiality, and their right to withdraw at any time without providing a reason. Throughout the study, the SPMHS team closely monitored the wellbeing of participants, ensuring no risk or harm was caused to them.

Intervention

SAMT comprises six weekly sessions of either in-person or online individual music therapy, each lasting 45–60 minutes.² These sessions were delivered by the lead researcher of this study – a registered music therapist with additional training in perinatal music therapy and three years of experience in mental health. In-person sessions took place at the regional SPMHS outpatient clinic in a central location, while online sessions were accessed via the *Attend Anywhere* platform (<https://www.attendanywhere.com/>). Participants joined the sessions through a link on any electronic device, requiring only their name and date of birth for access.

Guided by the UK Medical Research Council (MRC) framework for complex interventions (Skivington et al., 2021), SAMT was developed by examining research evidence and existing antenatal music therapy protocols (as discussed in the introduction), relevant theories (Bowlby, 2005; Rogers, 2013), and feedback from stakeholders (Cheung et al., 2024; Cheung et al., 2023). SAMT aimed to manage anxiety, improve wellbeing, and foster antenatal attachment. Specific objectives included supporting relaxation, facilitating emotional expression and regulation, creating space for mother-foetal bonding, and promoting self-efficacy towards pregnancy, childbirth, and parenting (Mastnak, 2016). Its seven components include music-assisted relaxation (Akmeşe & Oran, 2014; Bauer et al., 2021), identifying a bonding song (Hinesley et al., 2020; Loewy, 2015), musical bonding (Baltacı & Başer, 2021; Federico, 2005), song discussion (Federico, 2005; Horn et al., 2022), songwriting (or parody) (Carvalho et al., 2021; O'Reilly et al., 2023), creating pregnancy/birth playlists (Cheung & McCaffrey, 2022; McCaffrey et al., 2020), and creative music-making (Horn et al., 2022; Pierce, 1998). Detailed descriptions of these components can be found in Table A1 in the online supplemental data.

SAMT was rooted in person-centred therapy (Rogers, 2012) and the resource-oriented approach (Rolvsjord, 2010), aligning with the recovery model of mental health care (McCaffrey et al., 2018). SAMT empowered participants to take ownership of their recovery, utilising their strengths and resources rather than solely focusing on challenges. The session structure was co-created with participants, considering their needs, preferences, and emotional and physical states on the day of each session (Leask et al., 2019). Essential components, such as music-assisted relaxation and bonding, were integrated into session openings and closings, with other components remaining open for participants to select. This structure applied to both online and in-person sessions, with the variation being the availability of different musical instruments for participants who chose to engage in creative music-making. In addition, participants received a leaflet (see Figure A1 in the online supplemental data) containing suggestions for home-based relaxation and bonding activities, and additional relaxation resources or playlists were provided upon request. The programme was reported following the TIDieR checklist (Hoffmann et al., 2014) and Checklist for Reporting Music-based Interventions (Robb et al., 2018), as detailed in Tables A2 and A3 in the online supplemental data.

²Author's note: The study began as COVID-19 restrictions eased, allowing in-person sessions with safety measures. However, a surge in COVID-19 cases towards the end of 2021 led to the suspension of in-person sessions, limiting participants to online attendance only.

Data collection

Quantitative data

Participants' demographic and clinical backgrounds at baseline were collected through pre-programme questionnaires and referral forms. Changes in participants prescribed psychotropic medication were monitored throughout their participation in SAMT. Feasibility outcomes included retention, adherence (attendance and engagement with programme content outside sessions), and fidelity (the extent of intervention implementation), which were collected through the therapist's clinical notes and post-programme questionnaire (Figure 1).

Mental well-being was measured using the Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS). Participants were asked to rate from 1 (none of the time) to 5 (all of the time) on how often they have experienced each item in the past two weeks (University of Warwick, 2021). The Generalized Anxiety Disorder 7-item scale (GAD-7) was used to measure the changes in symptoms of anxiety before and after SAMT (Johnson et al., 2019). Participants were asked to rate from 0 (not at all) to 3 (nearly every day) on how often they have experienced each item in the past two weeks. Antenatal attachment was measured using the 21-item Prenatal Attachment Inventory (PAI) (Muller, 1993) that measures the relationship between a woman and their foetus with a four-point scale, ranging from "almost always" (4) to "almost never" (1). All three scales were included in the pre- and post-programme questionnaire.

To quickly assess the immediate impact of a single SAMT session, VAS-anxiety and VAS-closeness, adopted from previous studies (Shimada et al., 2021; Wulff et al., 2021), were used. Participants accessed these scales via *Qualtrics* to rate their levels of anxiety and perceived closeness to their baby on a rating of 1 – 10 before and after each session.

Qualitative data

Qualitative data were collected through responses to two specific open-ended questions in post-programme questionnaires, focusing on the helpfulness and overall experience of the music therapy sessions. Additionally, voluntary semi-structured interviews, ranging from 13 to 23 minutes, were conducted by an independent music therapist who had not previously interacted with the participants. These interviews were carried out either over the phone or via Zoom and were audio-recorded on a password-protected smartphone for subsequent analysis. Topic guides for the semi-structured interviews are available in Table A4 in the online supplemental data.

Data analysis

Statistical analyses were performed by the first author using the statistical software SPSS (Statistical Package for the Social Sciences version 28) for the quantitative data. Descriptive statistics, including mean and standard deviation for continuous variables and frequency tables for categorical variables, were used to present participants' baseline characteristics and feasibility outcomes. For efficacy outcomes, normality tests were applied to evaluate the data distribution. Paired sample t-tests were applied to normally distributed changes (GAD-7 and SWEMWBS), while non-parametric tests were employed for non-

normally distributed data (PAI and VAS). Effect size calculations were also considered.

Qualitative data were analysed using Braun and Clarke's (2022) six-step thematic analysis involving data familiarisation, generating initial codes, searching for themes, reviewing and defining themes, writing the narrative, and reporting the findings. The first author transcribed the interviews and the third and sixth authors validated the accuracy. Coding and preliminary theme exploration were collaboratively conducted by the first, fourth, and sixth authors through monthly team discussions. The fifth author further refined the final themes, with all authors participating in the final review process. Lastly, following the convergent triangulation design (Creswell & Plano Clark, 2011), an integrative analysis of both quantitative and qualitative findings was performed to synthesise and interpret the data comprehensively.

Results

Feasibility

Thirteen pregnant women were referred by the SPMHS. One woman experienced pregnancy complication after providing consent, and her consultant advised excluding her from the study. Twelve started SAMT, one participant discontinued due to childcare constraints for online sessions, and two discontinued following COVID-19 regulations that prohibited in-person sessions without explicit reasons. Nine participants (with codes ID P2-4, P7, P9-13) completed SAMT and assessments, resulting in a 75% retention rate. The flow diagram for participants is illustrated in [Figure A2 in the online supplemental data](#).

Regarding adherence, participants received an average of 5.33 sessions out of 6 ($SD = 1$). Three received fewer sessions due to hospitalisation ($n = 2$), family sickness ($n = 1$), early baby arrival ($n = 1$), or feeling too close to due date ($n = 1$). Participants reported frequent use of relaxation resources (mean frequency = 3.67 out of 5, $SD = 1.00$) and singing to their baby outside of the sessions (mean frequency = 4, $SD = 0$).

Regarding fidelity, all components of SAMT were implemented across both delivery modes. Most participants (78%) attended online sessions only, 11% attended in-person sessions only, and 11% hybrid (transitioning from in-person to online sessions). Core components, such as “music-assisted relaxation”, “musical bonding”, and “identifying a bonding song” achieved a 100% fidelity rate, while non-essential components varied between 44% and 89%. The most mentioned areas that participants felt addressed in SAMT were mother–infant bonding (100%), relaxation (89%), anxiety/stress management (78%), and emotional expression (56%). Additional areas like trauma recovery and preparation for childbirth were also highlighted. More details on the adherence and fidelity can be found on [Table A5](#) in the online supplemental data.

Demographics and clinical background

[Table 1](#) displays participants' baseline characteristics. The mean age was 29.33 years ($SD = 4.69$, 23–36). On average, participants began SAMT at 29 weeks of gestation

Table 1. Participants' characteristics at baseline

	Mean (SD, Range)	n (%)
Age	29.33 (4.69, 23–36)	
Gestation week at the beginning of MT	29 (2.64, 25–33)	
Parity		
Primipara (First pregnancy)		8 (89%)
Multipara (Had been pregnant before)		1 (11%)
Reasons for referral		
Symptoms/history of anxiety		8 (89%)
Symptoms/history of depression		6 (67%)
Previous trauma or loss		5 (56%)
Previous perinatal loss		1 (11%)
Tokophobia		1 (11%)
Prescribed psychotropic medication		2 (22%)
Baseline GAD-7	10.33 (4.21, 7–20)	
Mild anxiety (5–9)		5 (56%)
Moderate (10–14)		3 (33%)
Severe (>15)		1 (11%)
Baseline Well-being	19.36 (1.53, 17.43–22.35)	
18 or less (probably clinical depression)		3 (33%)
19–20 (possible mild depression)		4 (44%)
Baseline PAI	55.78 (9.99, 38–73)	

(SD = 2.64, range: 25–33). Most were first-time mothers (89%, $n = 8$), with a high prevalence of mental health issues: 89% ($n = 8$) reported anxiety, 67% ($n = 6$) had depression, 56% ($n = 5$) experienced previous trauma or loss, and 11% ($n = 1$) had tokophobia. Two participants (22%) were taking psychotropic medications before starting SAMT, with no dosage changes during the study.

Efficacy

Detailed results for the outcome measures are presented in [Tables 2](#) and [3](#).

Before and after SAMT

Mental well-being, as indicated by SWEMWBS scores, increased significantly from a baseline mean of 19.36 (SD = 1.53) to 23.37 (SD = 1.67) post-SAMT. The paired sample t-test revealed a mean difference of -4.01 (SD = 2.26, 95% CI: -5.75 to -2.27), indicating a large effect size ($d = -1.774$). All participants exhibited the minimally important levels of change (Shah et al., 2018).

Anxiety levels, measured by GAD-7 scores, decreased significantly from a baseline mean of 10.33 (SD = 4.21) to 4.11 (SD = 3.02) following SAMT, showing a reduction of 6.22 (SD: 2.68, 95%CI: 4.16, 8.28), and a large effect size ($d = 2.320$). All participants showed a reduction greater than the minimal clinically important difference (MCID) (Kounali et al., 2022). The entire confidence interval also lies above the MCID and zero, suggesting that SAMT may have a positive clinical effect (Lee et al., 2014).

The PAI scores also showed a significant median increase from 56 to 69 ($Z = -2.67$, $p = 0.007$), with a large effect size ($r = -0.89$), demonstrating a substantial impact on prenatal attachment.

Table 2. A summary of the statistical analysis

			Baseline	Follow-up	Difference	
	Normality test ^a	Statistical test	M (SD) or Mdn (IQR)	M (SD) or Mdn (IQR)	M difference (95% CI) or Mdn difference, Z, p-value	Effect size
Before and after SAMT (N = 9 participants)						
GAD-7	p = 0.736	Paired t-test	10.33 (4.21)	4.11 (3.02)	6.22 (4.16, 8.28) ^b	d = 2.32
SWEMWBS	p = 0.283	Paired t-test	19.35 (1.53)	23.37 (1.67)	-4.01(-5.75, -2.27) ^b	d = -1.77
PAI	p = 0.004	WSR	56 (12)	69 (14)	13, Z = -2.67, p = 0.007	r = -0.89
Immediate effect of a single session (N = 47 sessions)						
VAS-Anxiety	p = 0.018	WSR	5 (3)	2 (2)	-3, Z = -5.281, p < 0.001	r = -0.77
VAS-Closeness	p < 0.001	WSR	7 (3)	8 (3)	1, Z = -5.273, p < .001	r = -0.77

Means and Standard Deviation of the VAS ratings over six sessions

Session		1	2	3	4	5	6
VAS - Anxiety	Pre-session	5.89 (2.15)	4.89 (2.26)	4.33 (2.60)	4.63 (1.92)	4.17 (1.94)	3.17 (2.14)
	Post-session	3.22 (1.99)	3.89 (3.26)	2.44 (1.88)	2.13 (1.73)	2.17 (2.93)	1.83 (2.14)
VAS - Closeness	Pre-session	6.11 (1.69)	6.78 (1.99)	6.67 (2.60)	6.88 (2.59)	6.67 (2.88)	7.33 (1.86)
	Post-session	7.22 (1.64)	7.78 (2.05)	7.89 (1.69)	7.75 (1.75)	8.17 (1.47)	8.17 (1.33)

M = mean; SD = standard deviation; Mdn = median; IQR = interquartile range; CI = confidence interval; WSR = Wilcoxon Signed-Rank Test; SAMT = Specialised Antenatal Music Therapy; GAD-7 = Generalised Anxiety Disorder questionnaire; SWEMWBS = Short Warwick-Edinburgh Mental Wellbeing Scale; PAI = Prenatal Attachment Inventory; VAS = visual analogue scale. ^aShapiro-Wilk Test was performed for normality. ^bBoth the mean difference and 95% CI exceed the MCID for GAD-7 estimated at 1.5 – 4 (Kounali et al., 2022; Toussaint et al., 2020) and the minimally important levels of change estimated at 1 – 3 for SWEMWB, indicating clinical effectiveness (Shah et al., 2018).

Immediate effect of single session and trend over the course of SAMT

In total, 47 sessions were delivered for 9 participants. Wilcoxon signed-rank test showed a significant median decrease in VAS-anxiety scores from 5 to 2 ($Z = -5.281, p < .001$) and a significant median increase in VAS-closeness scores from 7 to 8 ($Z = -5.273, p < .001$), both with a substantial effect size ($r = -0.77$). These improvements in anxiety and closeness were consistent across sessions, indicating a progressive impact of SAMT.

Qualitative findings

The thematic analysis, derived from data gathered through nine post-programme questionnaires and seven semi-structured interviews, led to the development of four main themes. Theme 1: The therapeutic benefits of SAMT. Theme 2: The challenges and adaptability in an online setting. Theme 3: Participants' distinctive therapeutic experiences with SAMT. Lastly, Theme 4: Enhancing and expanding the programme.

Theme 1: Therapeutic benefits of SAMT

Participants spoke extensively about the therapeutic benefits of SAMT sessions, ranging from their lived experiences during the session to how they integrated the techniques into daily life for self-care, bonding, and baby care.

Table 3. Individual changes in anxiety, wellbeing, and antenatal attachment levels

Participant ID	Gestation (week)		GAD -7 (0-21) ^a		SWEMWBS (7-35) ^a		PAI	
	Baseline	Follow-up	Baseline	Follow-up	Baseline	Follow-up	Baseline	Follow-up
P2	32	37	7 (Mild)	0 (Minimal)	19 (Possible mild depression)	24 (Well)	62	69
P3	30	38	10 (Moderate)	3 (Minimal)	18 (Probable clinical depression)	24 (Well)	56	64
P4	26	34	7 (Mild)	5 (Mild)	21 (Well)	22 (Well)	59	67
P7	30	37	9 (Mild)	6 (Mild)	20 (Possible mild depression)	21 (Well)	55	80
P9	25	31	10 (Moderate)	4 (Minimal)	18 (Probable clinical depression)	23 (Well)	54	66
P10	27	37	8 (Mild)	0 (Minimal)	19 (Possible mild depression)	26 (Well)	45	77
P11	29	34	20 (Severe)	9 (Mild)	19 (Possible mild depression)	22 (Well)	60	72
P12	33	38	8 (Mild)	3 (Minimal)	22 (Well)	25 (Well)	73	81
P13	29	36	14 (Moderate)	7 (Mild)	17 (Probable clinical depression)	23 (Well)	38	49

GAD-7 = Generalised Anxiety Disorder questionnaire; SWEMWBS = Short Warwick-Edinburgh Mental Wellbeing Scale; PAI = Prenatal Attachment Inventory; ^aAll participants exhibited improvement exceeding the MCID for GAD-7 estimated at 1.5 – 4 (Kounali et al., 2022; Toussaint et al., 2020) and the minimally important levels of change estimated at 1 – 3 for SWEMWBS, indicating clinical effectiveness (Shah et al., 2018).

Subtheme 1.1: Improved well-being and reduced anxiety. All interviewees described feeling more relaxed after each session. Many of them described the session as a window for them to “switch off” from their busy lives or anxious thoughts. P2 described, “it was that kind of hour in the week where I literally just sit down and zone out of. . .it was just my little patch in the week”. She also reported how MT helped her to manage anxiety, with a noticeable reduction in panic attacks. P11 also described, “the relaxation parts really helped to unwind after unloading some of the thoughts on my mind and I found it helped me to separate those thoughts from affecting my day afterwards”.

Subtheme 1.2: Bonding with the foetus. All interviewees uniformly expressed that the MT sessions deepened their connection with their foetuses. They were moved and surprised by the extent of the reaction of the foetus during bonding activities in the sessions. P9, who had previously connected with her foetus through talking, noted increased activity during the sessions: “I didn’t think he would be as active as he was . . .

it was almost like he got up and had a dance when we were doing the music therapy.” P4, initially sceptical about bonding with her foetus, found her perspective transformed: “I didn’t quite believe in it [bonding] . . . it was actually really fantastic when we would play instruments and she would react to it . . . the bonding was really, really nice and enjoyable.”

Subtheme 1.3: Beneficial programme elements. Various elements of the programme stood out to participants for their effectiveness and positive impact. Notably, the music-assisted relaxation, including cued breathing, muscle relaxation, and mindfulness, resonated with all participants. P11 described:

... that [relaxation] just made the biggest difference ever to the whole session. I could sit around for the hour and then that 5–10 minutes . . . can just breathe and then . . . okay, now leave what happened in the session happen in the session. I can go about my day and function fine and not take my mood out on someone. . . I can breathe now, and my day can carry on. (P11)

The therapeutic effects of other components including song discussion, personalising a lullaby, and preparing birth playlists were also commented on by the participants. For instance, P9 discovered that music could help her identify and express emotions effectively, describing it as:

... using music as a form of communication helps me in a way that I never would have thought of before . . . So, I’d show her the song and then the next minute . . . I’d have spoken about something that I probably needed to talk about but never had felt like I could. . . (P9)

Furthermore, P10 reported the effectiveness of relaxation resources in reducing anxiety and aiding sleep. She also appreciated the encouragement to sing despite her initial reluctance and found exploring various music genres for labour to be particularly beneficial.

Subtheme 1.4: Practical application into daily life. Many participants expressed that the sessions equipped them with valuable techniques that could be incorporated into their daily lives for managing anxiety, expressing emotions, and interacting with their baby. For instance, P3 expressed that the grief over her father’s death had hindered her self-care and bonding with her child. With gentle guidance and support during the session, she became more intentional about self-care and bonding:

... it kind of kickstarted me into doing that . . . after everything we’ve been through; I wasn’t doing it [bonding]. I needed a little bit of guidance into . . . taking that step. . . I kept on, after sessions finished . . . so that’s kind of stirred me into doing that. (P3)

P4 shared that her spouse was also impacted by the outcomes of the session, as noted in her questionnaire feedback:

... how I can bond with my baby had a positive impact on my husband too. In the beginning . . . he was almost scared to touch my belly and was barely bonding with the baby, but . . . how baby reacts to what we sing . . . and how I can play with her or make her move . . . he started bonding by touching my belly without clothes and by the end of the sessions he would even put his ear to the belly and talk to our baby which I never thought he would change this much. (P4)

Theme 2: Challenges and adaptability in online setting

Various aspects of the online delivery modes were uncovered during the interviews. The challenges regarding the uneasy feeling of dealing with electronic devices, internet instability, and lack of private space were shared by most participants. While the majority speculated that they would have enjoyed an in-person session more, they also expressed a genuine appreciation for the flexibility the online platform offered after they overcame the initial uneasiness.

Subtheme 2.1: Disruptions due to spatial and internet challenges. Many interview participants reported connectivity issues that disrupted effective communication, P11 recounted, “the internet connection was just so bad...there was five- or ten-minutes checking if you could hear her [the music therapist] and she could hear you.” The online setting also posed emotional challenges. Some participants expressed their initial apprehensiveness about the online format. P9, for instance, described the difficulty of adapting to “talking to” a computer, which initially felt awkward: “it was the computer side of it that was harder for me to open up ...”. Moreover, maintaining privacy during the therapy sessions was a challenge for some participants. The occasional interruptions from family members walking in and out of the room were found to interfere with their therapeutic experience.

Subtheme 2.2: Appreciating the flexibility and convenience. Participants who attended online sessions expressed appreciation for the flexibility, safety, and convenience of the online format. They attributed their positive experiences to several factors: the convenience of avoiding lengthy commutes, enhanced safety measures against COVID-19, adaptable session schedules, accommodation for physical challenges, and the opportunity for rest and reflection post-session. For instance, P13 highlighted, “because I’m out in the country would have taken an hour either way in and an hour to do the session. It would have taken all day...it was more convenient for me that way.” P9, despite initial apprehension about the online format, found it to be highly practical. The flexibility and adaptability of the online sessions ensured her continued participation despite scheduling challenges. P7, who transitioned from in-person to online sessions during her pregnancy, particularly appreciated this flexibility as she faced mobility challenges during her pregnancy.

Theme 3: Distinctive therapeutic experiences

All participants shared that they initially approached SAMT sessions with apprehension, but they were able to engage with interest and comfort within the first few sessions. They attributed this change largely to certain programme elements and the person-centred approach.

Subtheme 3.1: Initial apprehensiveness. Many participants expressed feelings of apprehension and uncertainty about what the music therapy experience might entail. For instance, P4 described, “I’ve always liked music, but I didn’t really know how someone can engage you and so on. It sounds a little bit odd when you ask for music therapy.” P9 also felt her initial experience was “a bit nerve-wracking and rocky”. Nevertheless, as the sessions progressed, all participants reported that this apprehension was replaced with a sense of comfort and interest. P9 highlighted this shift, stating,

“within those one or two sessions that had completely calmed, and there was no anxiety, it became something that I kind of really looked forward to.” P4 shared her changed perspective, saying, “honestly, I didn’t expect this experience at all . . . I’m so happy I went for it, and I was very doubtful in the beginning.” P13 also elaborated on her initial concerns, stating:

I was kind of nervous going in because I don’t normally like doing art or music therapy, but I think I will give it a go anyway. And it ends up being a lot nicer than I thought it was gonna be.
(P13)

Subtheme 3.2: A person-centred alternative therapeutic experience. Regarding the therapeutic experiences, participants, especially those with experience of other therapy, appreciated the adaptability and accommodation of the sessions. P9 observed, “it’s very broad and kind of safe. It’s very tailored to you and how you’re feeling . . . It’s not like talk therapy; it’s more like a tailored experience that reaches you on a different level.” P13 added, “I wouldn’t normally feel comfortable with anything other than maybe talk therapy. But I was delighted with it. I was really surprised at how helpful and beneficial it was.” P11 elaborated,

It was very different, it wasn’t very repetitive, it was a new thing every time. It was just very calming. Normally when I’ve done [talk] therapy, sometimes . . . I’ve been angrier or more upset when I was leaving, whereas every time we finish the [SAMT] session, I felt very relaxed.
(P11)

All interview participants highlighted the value of the therapeutic relationship in their experiences. Participants commented on the therapist’s person-centred approach and empathy in creating a personalised and inviting atmosphere. P3 remarked, “she [the therapist] has a lovely gentle and empathetic manner which helped to relax me from the very beginning. She listened to me and my needs and tailored my sessions based on this.” P9 also shared, “She [the therapist] explained what we’re going to be doing and kind of fitted it around me, which was very nice because it felt personal . . . kind of picking and choosing what worked for me.”

Theme 4: Enhancing and expanding the programme

Participants offered thoughtful recommendations around enhancing and expanding the programme for the benefit of pregnant women.

Subtheme 4.1: Expanding the service to all pregnant women nationwide. Many participants expressed a desire to see the programme extended and made accessible to a wider audience. They recognised the therapeutic value of the programme and believed that it had the potential to benefit all pregnant women across the country. P6 noted, “I think this should be available to all pregnant women. It’s so wonderful, and I think all expecting mothers would benefit from it.” This sentiment was echoed by several other participants, indicating their beliefs in the broad-reaching potential of SAMT.

Subtheme 4.2: Extending programme duration might meet varying needs. While some participants found the six sessions satisfactory and believed that fewer would not suffice, a notable portion, particularly those who commenced the programme at an earlier stage in their pregnancy, expressed their desires for extended engagement. For

instance, P4, who began SAMT at the 26th week of gestation, offered her perspective, “six sessions flew away to be honest . . . if there is time for the pregnant ladies . . . until their due date, it would be nice to have a couple of more sessions.” P11, who started SAMT at the 29th week of gestation, expressed, “I’d rather keep doing it, but I know you only get a certain amount of weeks. . . . I felt like I didn’t have enough. I wished there was more.”

The relationship between qualitative and quantitative findings

The relationship between the quantitative and qualitative findings is jointly displayed in Table 4. The two types of data were integrated at the interpretation and reporting level using the explanatory unidirectional framework for convergent design integration (Moseholm & Fetters, 2017). The integration process was guided by the research aims through the lens of quantitative analysis. All quantitative findings are complemented by corresponding qualitative themes, which enrich the understanding of the results. The qualitative data offer insights into how and why SAMT could achieve clinical goals and help interpret patterns observed in the quantitative data. For example, themes related to the challenges and adaptability of the online setting help explain the high retention rate and shed light on the reasons behind the low attrition in the study.

Table 4. Relationship between the quantitative and qualitative findings

	Quantitative	Most Relevant Themes	Description
Retention	Retention rate ($N = 9$, 75%) Attrition ($N = 3$, 25%)	Appreciating the Flexibility, Safety, and Convenience Disruptions Due to Spatial and Internet Challenges	Drop-out due to lack of private space and change of COVID-19 measures.
Adherence & Fidelity	Delivery mode (78% online) High adherence (mean attendance = 5.44 session, with 78% achieved 100% of session) Using provided relaxation resources (mean frequency = 3.67/5) Singing to baby (mean frequency = 4/5) Core components: 100% achieved Other non-essential components varied	Appreciating the Flexibility, Safety, and Convenience Therapeutic Benefits of SAMT: Practical Application into Daily Life Distinctive Therapeutic Experiences: Person-centred, alternative therapeutic experience Beneficial programme elements	Being able to continue sessions despite changes of schedule and health status, due to the flexibility offered by online settings. Participants felt the sessions equipped them with useful techniques and resources to apply to daily life. Participants welcomed the tailored experience. The person-centred approach contributed to varying level of fidelity of the non-core components.
Efficacy	Statistically significant improvement in well-being, anxiety level, and antenatal attachment (PAI: $p < 0.05$, GAD-7/SWEMWBS/VAS-anxiety/VAS-closeness to baby: $p < 0.001$, large effect size)	Therapeutic Benefits of SAMT Improved well-being and reduced anxiety Baby’s Engagement & Bonding Beneficial programme elements Practical Application into Daily Life	Both analyses strongly indicated SAMT could reduce anxiety, improved their relationship with their unborn child and enhanced overall well-being. Participants were pleasantly surprised by baby’s active engagement during the sessions and often described the session helped them relax.

Descriptions of how participants found relaxation beneficial and enjoyed mother--foetal bonding contribute to understanding the improvements in well-being, anxiety levels, and antenatal attachment.

Discussion

This mixed-methods, proof-of-concept study provides initial evidence that SAMT is a feasible, acceptable, and effective intervention for the pregnant women experiencing mental health challenges in this study. Furthermore, it offers insights into how the structure and components of SAMT contribute to the therapeutic outcomes. The findings suggest that music therapy could be particularly beneficial to individuals who may find traditional talk therapy intimidating or stigmatising, and are seeking holistic, non-pharmaceutical alternatives to manage their mental health symptoms and build connections with their baby.

The high retention and adherence rate demonstrate the acceptability, accessibility, and perceived effectiveness of SAMT among participants. Despite reported issues in the online setting, the successful delivery of SAMT and the high fidelity rate of core components across both online and in-person modes highlight SAMT's compatibility with telehealth platforms like *Attend Anywhere*. The flexibility in delivery modes ensures safety and convenience, particularly for women navigating precarious life circumstances (Cephas et al., 2022) and during situations like the COVID-19 pandemic that imposed physical constraints (Agres et al., 2021).

While many studies suggest that the benefits of telehealth outweigh the challenges (Kantorová et al., 2021), this study reveals that apprehension, frustration, and concerns about privacy in an online setting could potentially impact the therapeutic process. Practitioners should carefully evaluate each individual's context to determine if the online mode is suitable. Furthermore, the initial apprehension experienced by participants points to the need for more engaging introduction materials beyond text-based information. Future implementations could benefit from developing a video guide that demonstrates the online setup and the SAMT process, and providing suitable devices for online engagement when needed. Such technical support may enhance participants' preparedness and overall engagement during the sessions.

Both quantitative and qualitative findings indicate the positive effects of SAMT in improving well-being, anxiety levels, and antenatal attachment among participants. While the small sample size limits the capacity for definitive statistical conclusions, it is noteworthy that all participants showed improvements across all measurements, and these large effect sizes were not attributed to medication change. Specifically, every participant exhibited improvements exceeding the MCID or minimally important levels of change. Unlike previous studies that reported small effects after 3 – 10 sessions and large effects after 16 – 51 sessions (Gold et al., 2009), this study suggests that SAMT can achieve a large effect within 3–6 sessions for this group of participants. This difference may be attributed to the variations in the severity of the mental health conditions between this study and previous ones. Additionally, participants' pregnancy status, where maternal-foetal attachment may play a role, could be a contributing factor, as higher maternal-foetal attachment is positively associated with improved psychological well-being (McNamara et al., 2019).

The immediate effect of a single SAMT session demonstrated in this study aligns with findings by Bauer et al. (2010), suggesting the potential of a single SAMT session

to alleviate antenatal stress. This supports the implementation of ad-hoc sessions for short-term patients and can enhance the inclusivity and applicability in various maternity settings, allowing for immediate stress relief and support whenever it is most needed. Future studies comparing therapeutic outcomes over various durations (e.g. 4, 6, 8, and 10 weeks) will provide direct evidence to determine the optimal duration of SAMT for the most cost-effective application.

The qualitative findings provide valuable insights into the factors crucial for the therapeutic outcomes of SAMT. A key aspect highlighted is the distinctive therapeutic experiences offered by SAMT, such as the medium of music (Pereira et al., 2011; Reybrouck et al., 2021) and the person-centred co-creative approach (Leask et al., 2019; Rogers, 2013). From the perspective of cognitive neuroscience, music engagement can elicit emotional responses without the need for explicit emotional processing (Reybrouck et al., 2021). This enables emotional release, and provides a therapeutic outlet for individuals who may not be prepared for verbal processing to express and manage their emotions. Moreover, music also affects the production of serotonin, norepinephrine, cortisol, oxytocin and dopamine which leads to reductions in anxiety, improvement in mood, and enhanced interpersonal connections including mother-foetal bonding (Chanda & Levitin, 2013). This helps explain why relaxation and musical bonding were highlighted in both quantitative and qualitative data.

While previous research showed women's hesitance to sing to their infants in the neonatal unit (Shoemark, 2017), this study found that the foetus reactions to antenatal singing motivated women to engage their voices for mother-foetal connection and engagement in sessions despite their initial reluctance. Identifying one lullaby and personalising songs also encouraged bonding at home, with potential benefits extending to the postnatal period and other family members. Through this process, SAMT boosted women's confidence in bonding with their foetus and developed a habit and repertoire of using singing for connection with their infants after birth, which could enhance postnatal attachment and benefit both mothers' and children's well-being (Fancourt & Finn, 2019).

The person-centred, co-creative approach values the importance of individuality, autonomy, and choices in the therapeutic process (Abrams, 2015, 2018; Leask et al., 2019). Being able to exercise control through choice is crucial for mental health recovery, as low perceived control is associated with higher symptoms of anxiety and depression (Broadbent et al., 2015). An increased sense of control can lower the stress hormone cortisol (Ang & Pizzagalli, 2019) and trigger dopamine release (Ly et al., 2019), which can foster positive behaviours and well-being. Person-centred approach has been highly valued in maternity care (Hunter et al., 2017; Petit-Steeghs et al., 2019), this study confirms its suitability and effectiveness in perinatal mental health care in Ireland.

Study limitations and recommendations

While this proof-of-concept evaluation indicates the feasibility and potential efficacy of SAMT for pregnant women with mental health conditions and provides valuable insights into the therapeutic mechanisms, this study has some limitations. The single-site design and small sample size limit the generalisability of findings, and the absence of a control group makes it difficult to attribute observed effects solely to SAMT. Additionally, the absence of an investigation into long-term outcomes, including birth outcomes and

postnatal well-being of mothers and infants, points to areas for further study. To build on this work, future research should aim for a multi-site randomised controlled design with a larger sample size to enhance the robustness and generalisability of findings. Investigating the intervention's effects across different durations and assessing long-term impacts on maternal mental health, childbirth outcomes, infant development, and postnatal bonding will be critical for understanding and maximizing the benefits of SAMT in perinatal mental health care.

Conclusion

This proof-of-concept study laid the groundwork for future study and represented an important step in understanding the potential benefits of SAMT and its mechanisms for pregnant women and its integration into perinatal mental health services. The observed improvements in well-being, anxiety reduction, and enhanced antenatal attachment indicate that SAMT could be a valuable treatment option for pregnant women experiencing mental health challenges. Future research involving control groups, larger sample sizes, multiple sites, and extended follow-up periods would further strengthen the evidence supporting the effectiveness of SAMT, supporting its potential inclusion in routine perinatal care.

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