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ORIGINAL ARTICLE

Enrollment cost and recruitment effectiveness in a deep transcranial magnetic stimulation clinical trial for older adults with depression: a mixed-methods analysis of recruitment strategies, facilitators, and barriers

Anne-Marie **Di Passa**,[1,2] Shelby **Prokop-Millar**,[1,2] Horodjei **Yaya**,[2] Emily **Vandehei**,[2,3] Carly **McIntyre-Wood**,[1,2,3] Allan **Fein**,[2,3] Emily **MacKillop**,[1,2] James **MacKillop**,[1,2,3] Dante **Duarte**[1,2,4]

[1]*Department of Psychiatry and Behavioural Neurosciences, McMaster University, Hamilton, ON, Canada.* [2]*Peter Boris Centre for Addictions Research, St Joseph's Healthcare Hamilton, Hamilton, ON, Canada.* [3]*Michael G. DeGroote Centre for Medicinal Cannabis Research, McMaster University, Hamilton, ON, Canada.* [4]*Seniors Mental Health Program, Department of Psychiatry and Neurosciences, McMaster University, Hamilton, ON, Canada.*

Objective: Recruitment challenges are inherent in clinical research and are particularly pronounced in older adults with depression, who often face unique barriers such as medical comorbidities and infrequent help-seeking behavior. Neurostimulation techniques, like deep transcranial magnetic stimulation (dTMS), are often unfamiliar to patients. The literature offers limited insight into the costs and practical guidance associated with recruitment strategies in dTMS trials. This study aimed to address these gaps by investigating the cost-effectiveness of various recruitment strategies for dTMS trials among older adults, in addition to potential facilitators and barriers to recruitment.
Methods: This mixed-methods retrospective analysis examined recruitment data from our pilot study investigating the effects of dTMS in older adults with depression. We assessed diverse recruitment methods by analyzing enrollment rates and conducting an enrollment-cost analysis. Recruitment-related barriers and facilitators were identified through a theoretical thematic analysis.
Results: Over 14 months, we received 185 referrals, resulting in 22 enrolled participants. Health care provider outreach to affiliated mental health clinics was the most effective recruitment method, with an enrollment-cost rate of 0.00189 (CAD 537.63/person enrolled). The second most effective recruitment method was Facebook, yielding an enrollment-cost rate of 0.00099 (CAD 925.93/person enrolled). Social support from research personnel was a potential facilitator of recruitment, while time-intensiveness and accessibility challenges were noted as potential barriers.
Conclusion: Our findings highlight both health care provider outreach within mental health clinics and Facebook advertising as effective recruitment strategies. Future research is needed to evaluate recruitment-related facilitators and barriers to dTMS interventions for older adults with depression.

Keywords: Clinical trials; deep transcranial magnetic stimulation; geriatrics; neurostimulation; psychiatry

Introduction

Recruitment is an ongoing challenge in clinical research. Low recruitment rates increase the likelihood of significant delays, prolonged expenses, insufficient sample sizes,[1-4] and early trial termination.[5,6] A cross-sectional analysis of over 600 terminated trials from ClinicalTrials.gov reported that 57% were due to low recruitment rates.[5] Moreover, in a review[7] of 114 randomized controlled trials, only 31% of the trials met their recruitment goals, with 53% requiring an extension. These extensions were related to recruitment delays caused by overestimating the number of eligible participants, staffing issues, and a lower-than-expected willingness to participate.[7]

Special populations, such as older adults with depression, pose an added challenge for clinical trial recruitment. Older adults have higher rates of comorbidities,[8-10] which may affect their eligibility to participate in clinical trials. Older adults are also more likely to have functional and mobility impairments,[11,12] potentially affecting their ability to travel to in-person sessions. Transportation challenges may also affect an older individual's willingness to participate in

Correspondence: Dante Duarte, Peter Boris Centre for Addictions Research, St. Joseph's Healthcare Hamilton, 100 West 5th Street, Hamilton, ON, Canada, L8P 3P2.
E-mail: duartedante@mcmaster.ca
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research.[13] A survey[14] of 150 older adults revealed that only 44% were inclined to participate in a clinical trial, with the most common reasons for declining being fear of harming their health and believing they are too old. Older adults with psychiatric conditions are also less likely to seek professional help than younger age groups,[15-17] possibly due to negative perceptions towards mental health care, medical comorbidities, and limited access to geriatric health care providers.[17] In older adults with anxiety and depression, these concerns may come hand in hand with additional worries, including apprehension about social stigma and skepticism toward mental health treatments and related costs, thus deterring them from seeking professional help.[16]

The current literature lacks in-depth information on recruitment strategies for clinical trials involving older adults with psychiatric conditions, such as major depressive disorder (MDD). We could find only two articles examining recruitment in older adults with depression, which investigated psychotherapy[18] and preventive interventions.[19] However, the effectiveness of recruitment methods used in neurostimulation interventions for older adults with MDD, such as deep transcranial magnetic stimulation (dTMS), remain unexamined. dTMS is a non-invasive brain stimulation technique often involving daily treatments over an acute period.[20,21] Unlike psychotherapy and wellness interventions, which employ psychosocial approaches and are associated with minimal side effects, dTMS stimulates distinct brain regions and poses greater risks, including headaches, scalp discomfort, and a very low risk of seizure.[22] These features may make dTMS sound intimidating or less familiar to potential participants, consequently posing a barrier to recruitment. Research is needed to provide insights into the effectiveness of recruitment methods for trials involving new and unfamiliar neurostimulation interventions like dTMS. A pilot trial by our group aimed to examine the feasibility, tolerability, and clinical effects of dTMS in older adults with treatment-resistant MDD. However, insights into the effectiveness of various recruitment techniques in older adults are lacking, although such insights are critical to advancing dTMS trial recruitment in this population.

This retrospective mixed methods analysis addresses a critical gap in the literature on recruitment methods in dTMS trials in older adults with MDD. To our knowledge, no similar studies have been published. We aimed to: 1) analyze the effectiveness of the diverse recruitment methods – including online advertising, physician referrals, and community outreach – used in our pilot trial, and 2) identify potential facilitators and barriers to recruitment in this population. We applied Braun and Clarke's[23] theoretical-thematic analysis model to evaluate the participants' verbal responses from semi-structured interview data. Understanding these factors is essential to overcome recruitment challenges and optimize accrual rates in older adults with MDD.

Methods

Study overview

This retrospective mixed-methods analysis evaluated quantitative and qualitative recruitment data from our group's open-label clinical trial (Clinicaltrials.gov ID: NCT05855850) conducted at St. Joseph's Healthcare, Hamilton, Ontario, Canada. The trial recruited older adults aged 60 to 85 with moderate-to-severe MDD as defined by the DSM-5. Primary inclusion criteria were a score of 20 on the 24-Item Hamilton Depression Rating Scale and treatment resistance to antidepressant therapy. Exclusion criteria were diagnosis with Axis I disorders other than depression, contraindications to dTMS treatment, or diagnosis with mild or major neurocognitive disorder. A complete list of inclusion and exclusion criteria is provided in the Supplementary Methods. The study received ethics approval from the Hamilton Integrated Research Ethics Board on January 29, 2023, and recruitment began in April 2023 (project 15344).

Potentially eligible participants were assessed for eligibility via online or telephone screening. If initially eligible, they were invited for an in-person screening for a medical history review and to identify contraindications to dTMS (i.e., seizures, pacemaker, etc.). After obtaining consent, the participants received a brief adaptation demonstration of the BrainsWay dTMS device to ensure comfort during stimulation and determine whether 20 dTMS sessions would be tolerable.

All participants provided written informed consent prior to enrollment. Enrolled participants received daily dTMS sessions, 5 days a week for 4 weeks, for a total of 20 treatments. Each session lasted approximately 30 minutes. Depressive symptoms and electroencephalography were recorded at baseline and at every fifth visit. Side effects were routinely evaluated (Figure 1).

Recruitment strategies

To enhance recruitment rates, we employed various recruitment strategies from April 2023 to May 2024. Potential participants were asked how they heard about the study. Participants either self-referred in response to advertisements or were referred by a health care provider familiar with the study. Interested individuals could contact our research team to complete a telephone eligibility screening or submit an online screening form. Only those who were interested and met the initial eligibility criteria were invited to attend an in-person screening for a thorough eligibility assessment. Recruitment methods included community engagement and outreach, family medical clinics, health care provider outreach within affiliated mental health clinics, newspaper advertising, and online advertising (i.e., Craigslist, Facebook, etc.). For an exhaustive list of recruitment strategies and implementation timelines, see Supplementary Table S1 and Supplementary Figure S1.

Measures of recruitment method effectiveness

To evaluate the effectiveness of recruitment methods, we focused on two key indicators: enrollment rates and the enrollment-cost rate (ECR). These metrics were selected because they capture the yield and resource efficiency, which are critical for optimizing study feasibility and budget allocation during the recruitment phase.

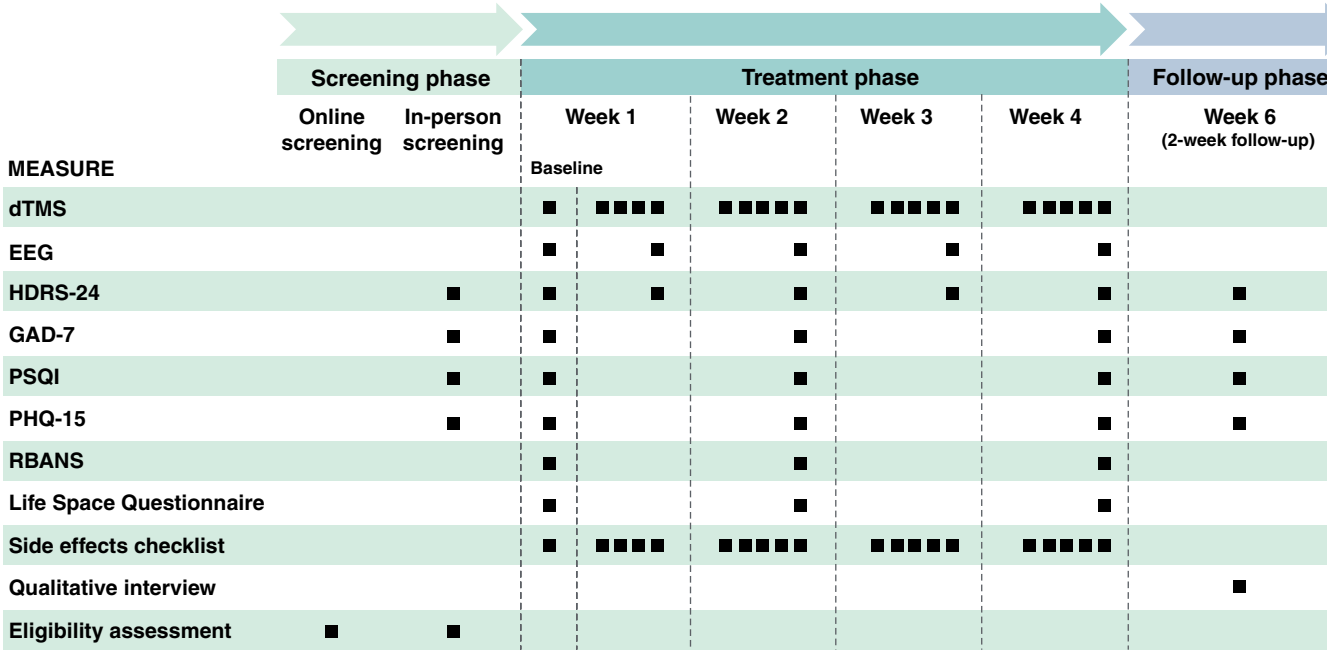


Figure 1 Study timeline and outcome measures. dTMS = deep transcranial magnetic stimulation; EEG = electroencephalogram; GAD-7 = Generalized Anxiety Disorder 7; GDS-30 = Geriatric Depression 30-item Scale; HDRS-24 = Hamilton Depression Rating Scale 24-item; PHQ-15 = Patient Health Questionnaire; PSQI = Pittsburgh Sleeping Quality Index; RBANS = Repeatable Battery for the Assessment of Neuropsychological Status.

Consistent with previous research,[24,25] cost analyses are a valuable tool for assessing and comparing the effectiveness of different recruitment strategies.

Enrollment rates

Enrollment rates were calculated by dividing the number of enrolled participants (N_E) by the number of referrals (N_R) for each recruitment source. N_R was defined as individuals who either completed the online screening form or contacted the research team to express interest in study participation (e.g., via e-mail or phone). For health care provider outreach, a referral was counted only if the patient expressed interest and consented to be contacted by the research team, either directly or through the provider. Neither incomplete screening forms nor online advertisement views were considered referrals.

N_E was defined as individuals who met eligibility criteria, signed the informed consent form, and initiated treatment. Individuals who were excluded during screening or who declined to participate were not included in this number.

$$\text{Enrollment rate} = \frac{N_E}{N_R}$$

Enrollment-cost analysis

The ECR was calculated by dividing N_E by the time and cost incurred per recruitment method. Higher ECR values indicated greater recruitment effectiveness. Research personnel estimated the number of hours spent and costs associated with each recruitment method. Time and cost estimation procedures are described in detail the Supplementary Methods. In this pilot trial, postsecondary research assistants were primarily responsible for recruitment. According to the Canadian Labour Force Survey of 2024,[26] the median hourly salary for postsecondary research assistants in Ontario from 2021 to 2022 was CAD 29.[27] This hourly wage was used as the variable w in ECR calculations.

$$\text{ECR} = \frac{N_E}{w\,t + c}$$

c = cost of the recruitment method (CAD); N_E = number of participants enrolled; t = time spent (in hours); w = median hourly wage of research personnel (CAD).

Facilitators and barriers to recruitment

We analyzed qualitative interview data to identify facilitators and barriers affecting recruitment. A semi-structured qualitative interview was performed at the 2-week follow-up to assess participants' overall perceptions and attitudes towards the study components. For detailed information on the qualitative interview procedure, please refer to the Supplementary Methods. We conducted a verbal thematic analysis of participants' responses, whereby common themes were identified and manually coded to identify facilitators and barriers to recruitment (see Statistical analysis section for more details on the thematic analysis).

Statistical analysis

All statistical analyses were performed using R Studio (version 2023.09.1+494). Enrollment rates across recruitment methods were compared using a two-tailed Fisher's exact test. A Bonferroni post-hoc test was used to adjust for multiple comparisons. Using the Agresti-Coull method, 95%CI were calculated for enrollment rates. A significance level of $\alpha = 0.05$ was applied for all statistical tests. As detailed in the Enrollment-cost analysis section, ECR analyses were descriptive and did not involve statistical hypothesis testing.

Qualitative interview data were analyzed using Braun and Clarke's[23] theoretical thematic analysis model. This model describes a six-step framework, whereby sentiments or "themes" are identified, coded for, and then tallied across the dataset. For additional information on how the thematic analysis was conducted, please refer to the Supplementary Methods.

Ethics statement

The data used in this study were obtained from our clinical trial registered on Clinicaltrials.gov (NCT05855850). This clinical trial received ethics approval from the Hamilton Integrated Research Ethics Board in Hamilton (project 15344). All participants provided written informed consent prior to enrollment.

Results

Sample characteristics

This study retrospectively analyzed data collected over a 14-month period from our pilot trial. From April 1, 2023 to May 27, 2024 (i.e., the end of the recruitment period), a total of 22 participants with MDD were enrolled, and 19 completed the study.

The intention-to-treat sample (n=22) consisted of 13 women (59.09%) and nine men (40.91%) with a mean age of 69.41 (SD, 6.0) years. All were of White/European ancestry. Regarding education level, 10 participants (45.45%) had a Bachelor's degree or higher (i.e., a Master's degree or a professional degree). Five participants (22.73%) reported some college or university education, and two (9.09%) had an associate's degree. Four participants (18.18%) had completed high school, and one participant (4.55%) had less than a high school education. Nearly all participants were retired (19; 86.36%). Two participants (9.09%) were still working, one full time and one part time. One participant (4.55%) was on a disability pension. The mean HDRS score at baseline was 30.18 (SD, 4.94), with all participants having moderate-to-severe MDD.

Recruitment, referrals, and enrollment

From April 1, 2023, to May 27, 2024, we received 185 referrals (Figure 2). Of the 185 referrals, 138 (74.59%) were

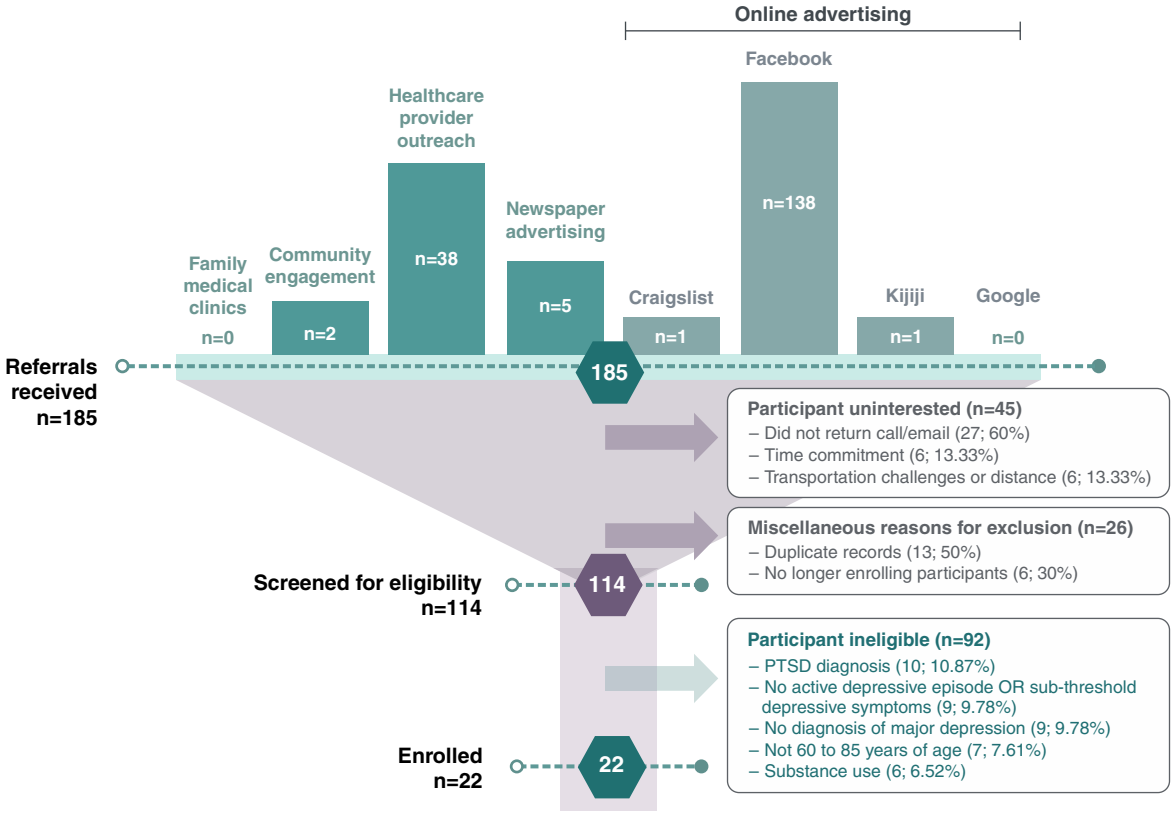


Figure 2 Recruitment flowchart. Please note that, because some potential participants had overlapping or multiple exclusion criteria, the reported percentages are noncumulative. PTSD = posttraumatic stress disorder.

self-referrals from Facebook, 38 (20.54%) were referrals from inpatient and outpatient mental health clinics within the St. Joseph's Healthcare Hamilton hospital network, five (2.70%) were self-referrals from individuals who viewed our local newspaper advertisement, two (1.08%) derived from community engagement methods, specifically, the McMaster Institute for Research on Aging (n=1) and the Centre for Medicinal Cannabis Research (n=1), one (0.54%) was a self-referral from Craigslist, and one (0.54%) was a self-referral from Kijiji. No referrals were received via Google or family medical clinics.

Of the 185 referrals, 45 showed no interest in enrolling, and 92 were ineligible (Figure 2). Twenty-six referrals were excluded due to miscellaneous reasons, such as duplicate referrals (i.e., mistakenly filling out a form twice). For more detailed information on the reasons for ineligibility, please refer to Supplementary Table S2.

Recruitment method effectiveness

Enrollment rates

The most effective recruitment method regarding enrollment rates was health care provider outreach within inpatient and outpatient mental health clinics within the affiliated St. Joseph's Healthcare network (Table 1). This recruitment method produced the highest enrollment rate of 0.316 N_E per referral received (95%CI 0.190-0.475). Facebook was the second most effective recruitment method, with an enrollment rate of 0.072 N_E per referral received (95%CI 0.038-0.130). Following a two-tailed Fisher's exact test, we found a significant difference in enrollment rates between recruitment methods ($p = 0.028$). Following a post-hoc test for multiple comparisons, we noted a trend-level difference in enrollment rates between: 1) health care provider outreach within inpatient and outpatient clinics and 2) Facebook recruitment methods ($p_{adj} = 0.079$). Other comparisons were nonsignificant. All other methods had enrollment rates of zero. Supplementary Figure S2 provides a breakdown of the total and cumulative number of enrollments per month by recruitment method.

Enrollment cost analysis

Following a comprehensive analysis of the estimated time spent (in hours), advertising costs, and labor costs, we calculated ECR for each recruitment method (Table 2). Health care provider outreach within inpatient and outpatient mental health clinics was the most effective recruitment method, with an ECR of 0.00186 persons enrolled per CAD, or an estimated CAD 537.63/enrolled participant. Twelve participants were recruited through this method (12/22; 54.55%), incurring an estimated cost of CAD 6452.50. The second most effective recruitment method was Facebook, with an ECR of 0.00108 persons enrolled per CAD, or approximately CAD 925.93/enrolled participant. Ten participants were enrolled through Facebook (10/22; 45.45%), which emerged as the most expensive recruitment method, incurring an advertising cost of CAD 2,420.35 (Supplementary Table S3) and an estimated final cost of CAD 9,235.35. The ECR of the remaining recruitment methods was zero, as they resulted in no enrolled participants. Newspaper advertising and the Google, Kijiji, and Craigslist recruitment methods were terminated due to insignificant referrals.

Facilitators of and barriers to recruitment

Of the 19 participants who completed the trial, 18 (94.74%) participated in a semi-structured interview at the 2-week follow-up to explore their experiences of participating in the clinical trial. Due to strong emotional reactions during the interview, one participant could not complete the questionnaire and was considered lost to follow-up. Following a theoretical-thematic analysis of the qualitative interview data, we identified 10 facilitators and six barriers to recruitment (Supplementary Table S4). The most common facilitators of recruitment were: 1) perceived social support and positivity from research staff (n=16; 88.89%), 2) reporting a positive, rewarding, and/or worthwhile experience (n=14; 77.78%), and 3) flexible scheduling and/or offering schedule accommodations (n=8; 44.44%). The most common barriers to recruitment were: 1) the significant time commitment (n=6; 33.33%), 2) challenges navigating the research facility (n=3; 16.67%), 3) a considerable commute to the research center (n=2; 11.11%), and 4) negative expectations or hesitancy towards enrolling in the dTMS study (n=2; 11.11%).

Table 1 Enrollment rates across recruitment methods

Recruitment method	N_R	N_E	Enrollment rate	95%CI[†]
Community engagement	2	0	0	N/A
Family medical clinics	0	0	0	N/A
Inpatient and outpatient mental health clinics[‡]	38	12	0.316	0.190-0.475
Newspaper advertising	5	0	0	N/A
Online advertising				
Craigslist	1	0	0	N/A
Facebook	138	10	0.072	0.038-0.130
Google	0	0	0	N/A
Kijiji	1	0	0	N/A

N/A = not applicable; N_E = number of participants enrolled; N_R = number of referrals received.
[†] Agresti-Coull Method.
[‡] Located within the St. Joseph's Healthcare Hamilton Network.

Table 2 Enrollment cost rates

Recruitment method	N_R	N_E	Estimated time spent (hours)	Advertising cost (CAD)	Final estimated cost (CAD)	ECR	Estimated cost per enrollment (CAD)
Community engagement	1	0	17.5	0.00	507.50	0	N/A
Family medical clinics	0	0	12.0	0.00	348.00	0	N/A
Inpatient and outpatient mental health clinics[†]	38	12	222.5	0.00	6452.50	0.00186	537.63
Newspaper advertising	5	0	2.0	366.40	424.40	0	N/A
Online advertising							
Craigslist	1	0	1.0	0.00	29.00	0	N/A
Facebook	138	10	235.0	2,420.35	9235.35	0.00108	925.93
Google	0	0	6.0	30.00	204.00	0	N/A
Kijiji	1	0	2.0	0.00	58.00	0	N/A

ECR = enrollment cost rate; N/A = not applicable; N_E = number of participants enrolled; N_R = number of referrals received.
[†] Located within the St. Joseph's Healthcare Network.

Discussion

We conducted a retrospective analysis exploring recruitment data, strategies, and costs from our dTMS trial in older adults with MDD. This analysis identified health care provider outreach within affiliated mental health clinics and Facebook advertising as the most effective recruitment methods, accounting for 20.54% and 74.59% of the 185 total referrals, with ECRs of 0.316 and 0.072, respectively. A thematic analysis of qualitative interview data revealed several important recruitment facilitators, including social support and positive interactions with research staff, perceptions of the experience as rewarding or worthwhile, and flexible scheduling and accommodation. Recruitment barriers included the significant time commitment, accessibility challenges in navigating the research facility, long commute times, and negative expectations or hesitancy towards dTMS.

Effectively targeting the desired population is a key challenge to recruitment. While traditional methods, such as patient referrals, flyers, and posted advertisements,[28,29] have been commonly used, the post-COVID era has prompted a shift towards digital research designs.[30-32] Accordingly, online recruitment modalities should be considered. Research suggests that online recruitment can be faster and more effective than traditional methods.[33,34] In the current analysis, Facebook advertising generated nearly 75% of all referrals, though it had a lower enrollment rate than recruitment through mental health clinics. This may reflect health care providers' ability to effectively identify eligible individuals, often having years of clinical experience. Successfully recruiting individuals who meet a study's eligibility criteria poses a significant barrier to recruitment.[35] The clinical expertise provided by health care providers may have further improved recruitment by effectively identifying eligible participants. Thus, targeting health care networks may be a valuable recruitment strategy.

Conversely, although Facebook yielded the highest N_R, these were self-referrals and were less likely to lead to enrollment. Many individuals voluntarily completed the screening survey but were ineligible. Facebook was also the most expensive recruitment strategy. Nevertheless, Facebook accounted for 10 (45.45%) of the enrolled participants and proved worthwhile. Future studies should diversify recruitment methods to maximize enrollment, including Facebook, despite its lower referral-to-enrollment rate.

Regarding the ECR analysis, Facebook had an ECR of 0.00108 enrollments per CAD (~CAD 925.93 per enrolled participant), while recruitment through affiliated inpatient and outpatient mental health clinics yielded a higher ECR of 0.00186 (~CAD 537.63 per enrolled participant). A systematic review by Speich et al.[36] reported a median recruitment cost of USD 409 (~ CAD 530) across 56 trials, ranging from USD 43 (~CAD 56) to USD 103,254 (~CAD 133,869). The high volume of Facebook referrals required additional staff time for screening, calling potential participants, and booking in-person screening visits. Considering the fewer N_R from the affiliated mental health clinics, less time was spent screening, calling participants, and booking screening visits. However, research personnel spent a comparable amount of time meeting with health care professionals to encourage recruitment from clinics and discuss referral strategies. Overall, our findings suggest greater investment of time and/or money in a recruitment strategy may generate more referrals, and in turn, greater enrollment.

It is also important to consider the relatively high cost of Facebook advertising in addition to labor costs. The ECR for mental health clinic recruitment included only labor costs, as no advertising was required. In contrast, Facebook was a high-cost advertising method, with additional time spent screening the large N_R. Despite these costs, both recruitment strategies were valuable and highlight the need for diverse recruitment strategies to expedite enrollment. A recent analysis[37] found that Facebook was the most cost-effective recruitment method for older adults who used sedatives, outperforming health care provider referrals and TV, newspaper, and Google advertisements. Furthermore, older adults have higher click-through rates on Facebook for clinical trial advertisements than younger age groups.[38] Consistent with these findings, we enrolled a significant number of participants from Facebook, which underscores its value in recruiting older adults.

A thematic analysis of interview data identified several recruitment facilitators: 1) perceived social support and

positive interactions with research personnel; 2) having a positive, rewarding, or worthwhile experience; and 3) flexible scheduling and accommodation. A recent cardiovascular trial[39] found that social support from peers and health coaches significantly increased participation. Importantly, older adults with low social support are at an increased risk for depression.[40] While social support is a known determinant of physical health and well-being,[41,42] few studies have examined its importance in clinical trial participation. Considering the association between low social support and depression in older populations, future research should explore the impact of social support on clinical trial recruitment for older adults with depression.

The most common recruitment barriers were: 1) the significant time commitment, 2) accessibility challenges in navigating the research facility, 3) lengthy commutes, and 4) negative expectations or hesitancy towards dTMS. Given that neuromodulation is an emerging area of research, there is a paucity of research exploring recruitment barriers in clinical trials involving brain stimulation interventions, such as dTMS. These interventions typically require a time-intensive acute treatment phase – for example, 20 sessions over 4 weeks, with daily appointments 5 days per week.[22] While each dTMS session is relatively brief (e.g., 30 minutes), the cumulative daily commitment could be a burden to participants. In contrast, wellness and psychotherapy interventions often allow for more flexible scheduling, which may better align with the daily activities and lifestyle of participants. In line with our findings, flexible scheduling and accommodation by research staff were identified as key recruitment facilitators. Future researchers and clinicians should evaluate the time-intensiveness of dTMS interventions as a potential barrier to recruitment and consider this factor when designing effective recruitment strategies.

In a recent nationwide survey of the United States,[43] individuals with depression, caregivers, and community members identified "a lack of understanding of intervention" as a key barrier to TMS treatment. This knowledge gap may contribute to negative expectations or hesitancy towards dTMS, particularly in older adults, and could impact their willingness to participate in clinical trials. Notably, a review of several health trials[7] identified lower-than-expected willingness to participate as a major contributing factor to recruitment delays. In contrast, our analysis identified the perceived burden of dTMS treatment – particularly the significant time commitment – as a prominent barrier to recruitment. Researchers should explore influences on willingness to participate, such as knowledge gaps or hesitancy, and the burdensome qualities of dTMS treatment, both of which can impact recruitment.

Another important consideration is transportation coverage and accessibility. During our trial, several potential participants were discouraged by transportation challenges. Two participants who completed the trial mentioned this during follow-up. Mobility impairments in older adults can disrupt travel to in-person sessions[11,12] and affect their willingness to participate.[13] Notably, some participants expressed appreciation for the transportation coverage we provided. Regular transportation compensation should be provided to older adult participants to address accessibility barriers and encourage recruitment.

This retrospective analysis has several limitations. First, we could not fully evaluate the effectiveness of recruitment methods that were terminated early due to funding limitations or low referral numbers. Second, the ECR was based on two estimates: 1) time spent on recruitment activities; and 2) the hourly wage of research staff. Though we aimed to measure the median hourly wage of research assistants in Ontario, the hourly wages of research personnel differed. Thus, this estimate may not precisely reflect the actual labor costs incurred. Third, recruitment data were collected retrospectively, which introduces the potential for recall bias and may limit the validity and reliability of the results. Fourth, the generalizability of this study's findings is limited by the single-site design and specific characteristics of the participant sample (e.g., older adults with depression). Nevertheless, this study offers valuable insights into effective recruitment strategies that can be implemented in clinical trial research among underrepresented senior populations. Finally, selection bias is an important limitation to consider when recruiting participants from different sources. A systematic review of Facebook's utility in health research highlighted its benefits in recruiting hard-to-reach populations and improving sample representation.[44] However, Facebook recruitment may favor individuals who are more comfortable with technology and self-motivated to engage in research, while recruitment through health care professionals may reach participants who primarily seek clinical care. These differences should be considered when examining recruitment outcomes and the generalizability of the sample.

In conclusion, we found evidence supporting the use of health care provider outreach in affiliated mental health clinics and Facebook advertising as effective recruitment methods for a dTMS trial involving older adults with depression. The impact of social support provided by research personnel and the time-intensive aspect of dTMS interventions should be further investigated as potential facilitators and barriers to recruitment, respectively.

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Disclosure

The authors report no conflicts of interest.

Data availability

The data that support this study are available from the authors upon request.

Author contributions

AMDP: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing.
SPM: Writing – review & editing.
HY: Writing – review & editing.
EV: Writing – review & editing.
CMW: Writing – review & editing.
AF: Writing – review & editing.
EM: Writing – review & editing.
JM: Funding acquisition, Writing – review & editing.
DD: Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing – review & editing.
All authors have read and approved of the final version to be published.

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