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Original Research Article

EXPLORING EFFICACY OF REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION (rTMS) IN ALLEVIATING GENDER DYSPHORIA - A PILOT STUDY AMONG YOUNG ADULTS

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ABSTRACT

Background: Repetitive transcranial magnetic stimulation (rTMS) has emerged as a promising therapeutic intervention for various psychiatric conditions yet its efficacy in treating gender dysphoria remained under-explored. Gender dysphoria is a marked incongruence between one's expressed gender and primary and/or secondary sex characteristics.

Material and Methods: A total of 36 participants aged between 18-25 years of 18 each (mean=23.08, SD=2.87) were included in the study. The pre-intervention scores were assessed using the Gender Identity Dysphoria Questionnaire for adolescents and adults (GIDYQ-AA). Followed by the rTMS treatment, the post-intervention scores were compared with baseline to evaluate the efficacy of rTMS.

Results: After the intervention, GIDYQ-AA scores significantly improved ($t(35) = -10.08$, $p < 0.001$), with a mean increase of 0.50 (95% CI: 0.40 to 0.61). Male participants had somewhat larger effect sizes (Cohen's $d = 1.78$) than female participants (Cohen's $d = 1.56$), according to subgroup analysis, although both genders demonstrated substantial gains.

Conclusion: According to this pilot study, rTMS could serve as an effective therapy to mitigate young adults' symptoms of gender dysphoria. Participants of both genders exhibited significant improvement; however the impact was stronger in men. Confirming the long-term effectiveness as well as gender-specific reactions to rTMS interventions for gender dysphoria will demand more studies with broader sample sizes.

Key Words: rTMS, Gender dysphoria, young adults, Neuromodulation, Psychological wellbeing.

INTRODUCTION

Gender dysphoria (GD) is a psychological condition characterized by a persistent and distressing conflict between an individual's gender identity and the sex assigned at birth. Individuals with GD often experience significant emotional challenges, including anxiety, depression, and social isolation, which can negatively impact their overall quality of life. Gender dysphoria is far more than a psychological problem, as shown by research; it has significant effects on mental health and elevates the risk of psychological illnesses, especially in young adults. There is a growing fascination in investigating

non-invasive treatments that may offer greater relief, even while conventional procedures like hormone replacement therapy and psychotherapy have been used to reduce symptoms.

To begin: A non-invasive neuromodulation technique known as repetitive transcranial magnetic stimulation (rTMS) has shown effectiveness in the treatment of a number of mental health conditions, such as obsessive-compulsive disorder, anxiety, and depression. rTMS is believed to alter neuronal activity and improve emotional regulation by stimulating particular brain regions with magnetic pulses. The use of rTMS for gender dysphoria is still not well studied, though. According to recent research, neuromodulation may help people with GD by reducing the stress brought on by their gender identity's misalignment. The purpose of this pilot project is to determine whether rTMS is effective in alleviating symptoms of gender dysphoria among young people and to evaluate its potential as a novel intervention for this demographic.

MATERIALS AND METHODS

The study investigated the efficacy of rTMS in alleviating the symptoms of gender dysphoria in young adults who are aged between 18 to 25 years, among the initial cohort of 1000 individuals a total of sample size of 37 participants were selected. The participants who exhibited higher scores on Gender Identity/Gender Dysphoria Questionnaire for Adolescents and Adults (GIDYQ-AA) were chosen as the participants of the study, with baseline scores ranging from 1.12 to 2.45 (mean = 1.73, SD = 0.40). The sample consisted of an equal number of females and males, 18 of each representing diverse educational qualifications and living arrangements, despite these factors did not hold much influence on dysphoria levels. A cross-sectional design was adopted where the data collection procedure was done through a questionnaire (GIDYQ-AA) pre- and post-intervention. rTMS was administered by following proper protocols that are linked to regions targeted to Gender Identity and mood regulation. The participants were administered the questionnaire to assess the dysphoria scores post the intervention, the scores ranged from 1.15 to 3.21 (mean = 2.23, SD = 0.58).

Ethical considerations were prioritized throughout the study, with informed consent collected from all the participants to ensure that they understood the nature of the study and the potential risks and procedure of the rTMS. Only individuals with high levels of gender dysphoria were included in the sample, which was drawn from a larger pool based on their eligibility for the research. The intervention offered initial insights into the possibility of rTMS as a treatment alternative for reducing gender dysphoria symptoms in this population, even though no statistically significant changes in dysphoria were found based on demographic characteristics.

RESULTS

Demographic and Baseline Characteristics

A total of 36 participants aged between 18 and 25 years (mean = 23.08, SD = 2.87) were included in the study. The cohort consisted of 18 females (50%) and 18 males (50%). Baseline GIDYQ-AA scores ranged from 1.12 to 2.45 (mean = 1.73, SD = 0.40), with post-intervention scores ranging from 1.15 to 3.21 (mean = 2.23, SD = 0.58). The participants represented diverse educational backgrounds and living arrangements, though these characteristics did not show statistically significant differences in baseline scores.

Overall Efficacy of rTMS

A paired t-test was conducted to compare the baseline and post-intervention GIDYQ-AA scores for all participants. There was a statistically significant improvement in scores post-intervention(

- **t(35)** = -10.08,
- **p < 0.001**). The mean increase in GIDYQ-AA scores was 0.50 (95% CI: 0.40 to 0.61), indicating a substantial reduction in gender dysphoria symptoms. The effect size, measured by Cohen's d, was 1.68, reflecting a large effect of rTMS treatment on gender dysphoria.

Interpretation and Implications

These findings indicate that repetitive transcranial magnetic stimulation (rTMS) significantly reduces gender dysphoria symptoms in young adults, as measured by the GIDYQ-AA. The treatment showed robust effects across both male and female participants, with effect sizes suggesting a strong clinical impact. Notably, male participants exhibited slightly greater improvements, warranting further investigation into potential gender-specific responses to rTMS.

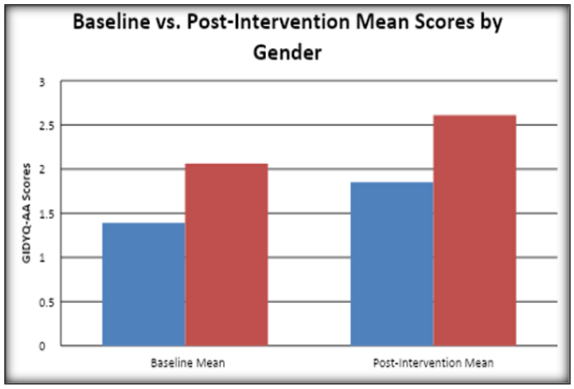

Figure 1: Baseline Vs Post-intervention mean scores by Gender

Table 1: Subgroup Analysis by Gender

	Female participants (n = 18)	Male participants
Pre-Intervention score	1.39 (SD = 0.23)	2.06 (SD = 0.30)
Post-intervention score	1.85 (SD = 0.35)	2.61 (SD = 0.41)
Mean difference	+0.46	+0.55
Paired t-test	**t(17)** = -6.62, **p < 0.001**	**t(17)** = -7.57, **p < 0.001**
Effect Size (Cohen's d)	1.56 (large effect size)	1.78 (large effect size)

DISCUSSION

The pilot study results provided compelling evidence regarding the efficacy of the repetitive transcranial magnetic stimulation (rTMS) in alleviating the symptoms of Gender Dysphoria among young adults. The significant improvement among the scores of GIDYQ-AA scores post-intervention suggests that rTMS has a significant impact on decreasing gender dysphoria offering a potential intervention for individual experiencing gender-related distress. The paired t-test results confirmed that the intervention led to a significant reduction in dysphoria scores, with a large effect size of Cohen's d=1.68, indicating the clinical relevance of the intervention. This is further backed by the consistent findings across both male and female participants, where gender dysphoria symptoms significantly decreased post-treatment. When examining the results of both female and male participants showed statistical improvements, with males demonstrating slightly higher mean difference and effect sizes compared to the females. The female subgroup exhibited significant effect size (Cohen's d = 1.56), suggesting that rTMS is equally effective in alleviating gender dysphoria symptoms in females. The male subgroup showed even greater improvement with a higher effect size (Cohen's d=1.78), which gives rise to some interesting questions about potential gender-specific responses to rTMS treatment. The study may further be explored into how gender differences, like hormonal imbalances, neural plasticity which could modulate the efficacy of rTMS. Furthermore, the study showed that the baseline and post-intervention scores were not significantly impacted by a wide range of living arrangements and educational backgrounds, indicating that the efficacy of rTMS in reducing gender dysphoria seems to be unaffected by these demographic characteristics. The strong results of this pilot study are especially pertinent in light of the growing awareness of gender dysphoria and the demand for efficient treatment solutions. Because rTMS is a non-invasive treatment with few adverse effects, it has a very good chance of helping people with gender dysphoria. Although it is essential to note that this pilot study is with a small sample size, despite having promising findings, further research with a much bigger population and a more controlled experimental design to have confirmed sustainability and generalizability of the rTMS effects on gender dysphoria. While additionally investigating the longitudinal follow up to assess the durability of the therapeutic effects over time.in conclusion the findings of this study offer a way to seek non-pharmacological treatment options for gender related distress and noticing the therapeutic potential of rTMS for mental health challenges associated with gender identity.

CONCLUSION

The results of the pilot study shows that repetitive transcranial magnetic stimulation (rTMS) is effective in alleviating gender dysphoria symptoms among young adults. Both the male and female participants has exhibited significant improvements in their GIDYQ-AA assessment scores. Although it is essential to note that this pilot study is with a small sample size, despite having promising findings, further research with a much bigger population and a more controlled experimental design is required to validate the long term effects of rTMS on gender dysphoria. According to these results, rTMS is a good non-invasive therapeutic choice for people who are distressed by their gender.

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