Online Graded Motor Imagery is Effective in Women Diagnosed With Pelvic Pain: A Randomized Controlled Trial.

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ABSTRACT

OBJECTIVE. Effective therapeutic strategies are crucial for managing Genito-Pelvic Pain/Penetration Disorder (GPPPD), a condition presenting challenges for both patients and health care providers. This study aims to assess the effectiveness of an online Graded Motor Imagery program in alleviating pain intensity and improving sexual function in women diagnosed with GPPPD.

METHODS. Eighty-seven women were randomly assigned to either an online Graded Motor Imagery group or a control group. The online Graded Motor Imagery protocol involved engaging participants in 2-week segments of left/right judgment exercises, mental simulation of movements, and gradual exposure therapy. After 6 weeks, we assessed pain intensity and sexual function. The control group gained access to the program upon study completion.

RESULTS. The online Graded Motor Imagery group demonstrated a significant reduction in pain intensity, coupled with improvements in sexual function. Notably, participants with enhanced movement imagery abilities experienced greater improvements, while those with negative beliefs and thoughts regarding vaginal penetration showed lower sexual function scores.

CONCLUSION. An online Graded Motor Imagery program is effective in alleviating the pain burden faced by women dealing with GPPPD.

IMPACT. Effectively addressing pelvic pain in patients remains a daunting challenge for physical therapists. Therefore, implementing efficient and easily accessible strategies is crucial. The incorporation of Graded Motor Imagery intervention proves to be an effective approach for improving both pain and sexual functioning in women with GPPPD.

Keywords: Pain, Pelvic Pain, Physical Therapy Modalities, Randomized Controlled Trial, Sexual Dysfunction, Physiological

INTRODUCTION

Genito-Pelvic Pain/Penetration Disorder (GPPPD) is a common condition described as persistent or recurrent pain during penovaginal reception. It is categorized as a sexual dysfunction in the Diagnostic and Statistical Manual of Mental Disorders.[1] GPPPD is characterized by persistent or recurrent difficulties with (1) vaginal penetration during intercourse, (2) pain during intercourse or penetration attempts, (3) marked fear or anxiety about vulvovaginal or pelvic pain anticipating, during, or due to penetration, and (4) pelvic floor muscle tension during penetration attempts. To diagnose GPPPD, 1 or more of these symptoms must be present for at least 6 months.[1] This disorder affects 14% to 34% of premenopausal and 6.5% to 45% of postmenopausal women.[2,3] Despite the large percentage of women diagnosed with this disorder, only 50% of affected women seek treatment, and misdiagnoses occur for 52% of them.[4] Due to the high prevalence of GPPPD, the lack of treatment and misdiagnosis become significant economic issues and cause distress for many women, affecting their quality of life and that of their partners.[5]

The aetiology of GPPPD is unclear. It is a multifactorial condition affected by biomedical factors, such as irritable bowel, pelvic adhesions, or vaginal infections, as well as psychological and social factors, including cognitive, behavioral, and interpersonal influences.[6] As such, the treatment must be multimodal. Medical therapy and surgery have shown to be effective in treating this disorder, but leading to a poor sexual function as surgery decreases vulvar region sensitivity.[2] Also, in women with sexual dysfunction, there is a higher rate of negative cognitions and beliefs about vaginal penetration resulting in modulation of pain intensity. Other treatment options such as pelvic floor physical therapy and cognitive-behavioral therapy appear to reduce pain intensity and pain-related disorders.[2]

GPPPD is treated as persistent pain since it shares similar traits with other conditions, such as phantom limb pain and Complex Regional Pain Syndrome.[7] These conditions show adaptations in their peripheral and central nervous systems, known as neuroplastic changes. These changes occur after extended persistence of pain and includes increased excitability of the primary sensorimotor cortex, alterations in the tactile representational fields in the cortex, and central sensitization.[6] With persistent pain, the nociceptive system and the central representation of the body change, leading to dysfunctional pain processing and pain modulation.[8,9] Neuroplastic changes have been demonstrated in women diagnosed with GPPPD.[6]

These findings suggest that there is a role in the treatment for GPPPD focusing on the maladaptive neuroplastic changes. Currently, there is evidence for the use of cognitive-behavioral therapy, education, and gradual exposure treatment options for GPPPD.[2,10–14] A commonly used therapy in similar clinical presentations is Graded Motor Imagery (GMI).[15] GMI is a non-invasive treatment created and developed by David S. Butler and G. Lorimer Moseley aimed at managing persistent and complex pain states.[16] It consists of 3 phases targeting the activation of different brain regions in a graded manner. The treatment consists of implicit motor imagery (performing tasks such as left/right discrimination judgements), explicit motor imagery (guided imagery exercises), and mirror therapy **(**which involves the use of a mirror to create a visual illusion of movement in the affected body part).[16] To obtain the greatest benefits of a GMI treatment, movement imagery ability, which refers to the capacity to vividly imagine performing movements without physically executing them, must be present as it facilitates the engagement of neural pathways associated with movement and contributes to the effectiveness of the treatment.[16]

Currently, GMI is being used successfully by physical therapists to treat chronic low back, hand, and foot pain.[8,17–19] However, there is still no evidence for using GMI for GPPPD. A recent study[5] used implicit motor imagery to treat persistent pelvic pain, employing images of the abdominopelvic body area for left/right discrimination judgements. This assessed the patient's capacity to determine whether the image corresponds to the right or left side of the body, producing major sensorimotor cortical activity. Implicit motor imagery is found to be altered in women with chronic pelvic pain.[5] Another study used images of genital pain-related stimuli, similar to those used in explicit motor imagery, in women experiencing GPPPD.[6] They showed that these images produced both anticipated anxiety and anticipated pain, but they were not exposed gradually.

Given that gradual exposure to painful body movement images has been demonstrated to improve pain in low back, hand, and foot pain, it is reasonable to hypothesize that it will also be useful in women with GPPPD.

The present study represents an initial step in determining whether GMI is an effective treatment option for women diagnosed with GPPPD using an online program, ensuring that women have access to effective treatment from the privacy of their homes. As online interventions are a valid modality for providing health education,[20] we hypothesize that an online GMI program will also be effective. Drawing inspiration from successful models like

Zarski et al.'s eHealth platform intervention,[11] our protocol was disseminated through an intuitive online app and various accessible platforms, ensuring ease of access and flexibility for participants. By embracing innovative delivery methods, our study not only contributes to the growing body of evidence supporting GMI for GPPPD but also sheds light on the potential of online platforms to revolutionize the delivery of evidence-based interventions for pelvic pain disorders.

To our knowledge, there are no studies using a complete GMI program in women diagnosed with GPPPD. Therefore, the main objective of this study is to assess the efficacy of a GMI program on pain intensity and sexual function on women diagnosed with GPPPD. A secondary objective is to assess the influence of thoughts and cognitions regarding vaginal penetration, and movement imagery ability on the results of the GMI program.

MATERIAL AND METHODS

Design

A randomised controlled trial was conducted to assess the effects of an online GMI program compared to a control group in women diagnosed with from GPPPD. The protocol for this clinical trial was approved by the Ethics Committee of the University of Valencia with reference number 1741806, and was prospectively registered in an international public registry, ClinicalTrials NCT05637502. The study was conducted in accordance with the Declaration of the World Medical Association, and every participant was briefed on the study procedure and provided written consent.

Participants were recruited during the months of April and May 2023 at Physical Therapy clinics specialized in pelvic floor disorders around Valencia, Spain, through social media accounts belonging to the members of the research team, via email, and collaborating with a Spanish association for patients diagnosed with chronic pelvic pain (*Asociación de Dolor Pélvico Crónico*, ADOPEC). Prior to enrolment, potential participants were asked to fill in an online form with their personal information and a questionnaire for discriminating chronic pelvic pain validated in Spanish (CPPQ-Mohedo) to assess eligibility for the study.[21]

Protocol deviations were identified during the conduct of the study. Initially, participants in the control group were intended to receive a therapeutic educational program. However, after careful consideration, it was decided that the control group would receive no

intervention during the study period and would instead be granted access to the online Graded Motor Imagery program upon study completion. This adjustment was made to maintain consistency in the study design and to ensure comparability between the intervention and control groups. Additionally, while the initial protocol intended to assess pain catastrophizing and pain-related fear as secondary outcomes, it was decided to focus assessments solely on pain intensity and sexual function. This decision was made to streamline data collection and analysis, prioritizing the primary outcomes of interest and reducing participant burden. Furthermore, the discrepancy regarding the primary outcome time frame, initially registered as 1 week, was an oversight during registration. The correct duration of the protocol is 6 weeks, which was accurately reflected in the study design and implementation.

Eligibility criteria

Participants were included if they were: (1) Adult women (>18 years) and (2) experienced pain with vaginal penetration during sexual intercourse more than 6 months, and (3) if they scored more than 6 points in the CPPQ-Mohedo questionnaire. Participants were excluded if they had a medical condition that could explain the presence of pain reasonably, such as an infection, a vulvar dermatological condition, or recent post-surgical scar tissue.

A total of 96 participants completed the initial form. From this sample, participants who had experienced pain less than 6 months (n = 9) were excluded, and additional participants (n = 4) refused to continue, leaving a total of 13 participants withdrawn before allocation. A sample of 83 participants was randomized using a sealed opaque envelope system with a 1:1 ratio to either the GMI group or control group. Participants were blinded to their group assignment by informing them that access to the program would be provided at a specified time, without disclosing when. This ensured blinding, as the intervention group received immediate access, and the control group gained access post-intervention. Additionally, researchers conducting assessments were independent from allocation and had no knowledge of group assignments, maintaining blinding throughout data collection and analysis.

Interventions

Participants allocated to the intervention group received a tailored GMI program for pelvic pain. Following the protocols reported in other studies,[22–25] and aligning with principles of neuroplasticity, allowing adequate time for the brain to adapt to the therapeutic interventions this program had a total duration of 6 weeks,[16] the program divided in 3 different phases, each

one lasting 2 weeks. Participants were sent fortnightly emails introducing the exercises they must complete in each phase.

The first phase involved an implicit motor imagery exercise. This phase consisted of viewing pain-related images through a web version of an app (App-Mohedo) for the left/right laterality discrimination judgement task. Photographs of the abdominoperineal area were shown and participants had to respond if the photograph represented a left or right side perspective by pressing a button on their mobile phones.[5] After 2 weeks, the second phase of the program was initiated.

The second phase consisted in an explicit motor imagery exercise. This exercise contained 6 audio recordings where participants had to listen and imagine several exercises. The audios represented a gradual progression of potential painful activities. They were developed by members of the research team, expert physical therapists in pelvic floor disorders with the assistance of a sex therapist, and the content was based on the Sensate Focus exercises, developed and published in 1970 by Masters and Johnson,[26] leading a progression from a non-genital touch to genital touch, and finally penetration. Audios were sent every 2 to 3 days, and their mean duration was 30 minutes.

Regarding the third phase, a graded exposure exercise program was implemented. Participants received a document and a brief explanatory video with the activity they had to achieve every 2 days. Gradual exposure started by self-exploration and ended with sexual intercourse. Activities the participants had to complete were also based on the Masters and Johnson's sexual therapy program, Sensate Focus.[26,27]

Between phases, the researchers responsible for assessments contacted participants to ensure adherence to the assigned tasks and to address any queries. Specifically, researchers conducted scheduled check-ins to confirm that participants were following the program protocol, and to clarify any uncertainties or difficulties encountered. This approach was implemented to ensure that participants fully understood the instructions and to support consistent engagement with the intervention.

The control group initially received no intervention at all but completed outcome assessments every 2 weeks. Post-intervention completion, participants allocated in the control group were given access to the full GMI program.

Outcomes

Two blinded members of the research team conducted the assessments. Demographic characteristics included age, participant's level of education (established according to the International Standard Classification of Education),[28] marital status and if receiving current treatment. Randomization was employed to ensure an even distribution of participants across treatment groups, and no specific inclusion criteria based on demographic factors were applied, allowing for a diverse representation of participants in the study.

Primary outcome: Pain intensity was assessed through the Visual Analogue Scale (VAS). VAS was measured before and after the intervention and in-between each phase of the program. Scores are based on self-reported measures registered with a single handwritten mark placed at one point along the length of a 100 mm line that represents a continuum between the 2 ends of the scale— "no pain" on the left end (0 mm) of the scale and the "worst pain" on the right end of the scale (100 mm).

To assess sexual function, the short version of the Female Sexual Function Index (FSFI-6) was used. In this reduced version, 6 of the original 19 items are assessed, involving 1 item per domain. The Spanish validated version for this questionnaire was used.[29] Scores can range from 2 to 30, higher scores indicating better sexual function.

Secondary outcome: Movement Imagery Questionnaire-Revised (MIQ-R) is a tool used to assess the participant's ability to mentally see and feel movements. The validated Spanish version of the MIQ-R was used.[30] Participants were asked to imagine 4 movements and evaluate in a scale ranging from 1 to 7 how easy it was to visualize and feel that movement, being 1 was very difficult to see/feel and 7 was very easy to see/feel. The score ranges from 8 to 56 points, higher scores resulting in better movement imagery ability.

Participant's beliefs and thoughts regarding vaginal penetration were assessed using the validated version in Spanish of the Vaginal Penetration Cognition Questionnaire (VPCQ).[31] It consists of a 22-item Likert scale ranging from 0 (not at all applicable) to 6 (very strongly applicable). It evaluates 5 different domains related to vaginal penetration, including control cognitions, catastrophic and pain thoughts, self-image beliefs, positive cognitions, and genital incompatibility. Higher scores in every domain imply worse cognitions about vaginal penetration, except for the control cognitions domain, which has a reverse score, so higher scores show higher levels of perceived penetration control.

Statistical analysis

Statistical analyses were carried out with SPSS (SPSS Inc; Chicago IL, USA) software, in its 28.0 version for MacOS. Descriptive statistics were used to report demographics of the sample. Mean and standard deviation were used to report quantitative outcomes and frequencies were used to report qualitative outcomes. Data distribution normality was examined using the Kolmogorov-Smirnov test.

The determination of the required sample size indicated that each group should consist of a minimum of 40 participants. This configuration would provide 80% statistical power to identify a clinically meaningful reduction of 1.4 points in pain intensity (VAS), standard deviation of 1.3 points, derived from our previous research,[20] while maintaining an α-error level of .05.

Pain intensity and sexual function were analysed employing a mixed model 2-way repeated measures ANOVA to assess within-subject (time, pre-post) and between-subject (group, GMI or control) differences. Additionally, the interaction between group and time was assessed to examine if the effects of the intervention differed over time. Further examination of group disparities was conducted through the Bonferroni post-hoc test.

Furthermore, an intention-to-treat analysis was conducted to include all participants according to their original group assignment, regardless of whether they completed the intervention or not. This analysis will provide a more conservative estimate of treatment effects and ensure the integrity of the randomized trial design.

The outcomes of the ANOVA analysis were subsequently employed to establish correlations between participants' movement imagery ability, and their beliefs and thoughts regarding vaginal penetration. Due to the inherent nature of the outcomes, Pearson's correlation coefficient was utilized for these analyses.

Role of the Funding Source

The funders played no role in the design, conduct, or reporting of this study.

RESULTS

Demographic data of the sample is shown in Table 1. No statistical differences between groups were found across all demographic variables. 96 participants were initially recruited for the study, 9 were excluded for not meeting eligibility criteria and 4 refused to continue with the intervention. While efforts were made to ascertain the reasons for participant dropout, those

who discontinued did not provide specific explanations. Therefore, reasons behind dropout remain unknown. 83 participants were analyzed. Participant flow throughout the study is shown in Figure 1. Follow-up assessments were conducted every 2 weeks over a total 6-week period. Researchers administering assessments regularly queried participants regarding their task completion, and all participants confirmed their adherence to the assigned tasks.

Results of the ANOVA analyses are presented in Table 2. These results demonstrate a significant improvement in pain intensity over time within the GMI group ($P<.05$). Furthermore, an interaction effect between group and time was observed for pain intensity ($P<.05$), indicating that the effects of the intervention varied over time. Post-hoc comparisons revealed a significant improvement in pain intensity over time within the GMI group ($P<.05$).

Regarding sexual function, while the GMI group exhibited a non-significant improvement, the control group showed a trend towards worsening. The interaction effect between group and time was also non-significant ($P = .37$). Changes in pain intensity and sexual function over time are shown in Figure 2 and Figure 3, respectively.

The intention-to-treat analysis revealed similar trends to the per-protocol analysis, with a significant improvement in pain intensity over time within the GMI group ($P<.05$). Additionally, the interaction effect between group and time remained significant ($P<.05$). These findings support the robustness of the intervention effects observed in the per-protocol analysis and underscore the validity of the study findings.

A correlation analysis between results from the ANOVA and participants' movement imagery ability and their beliefs and thoughts regarding vaginal penetration are shown on Table 3. Results show a negative significant correlation between pain intensity results and movement imagery ability on the intervention group, meaning participants with higher MIQ-R obtained lower scores on the VAS. Also, a negative significant correlation can be observed between sexual function and the beliefs and thoughts regarding vaginal penetration in the control group, meaning that participants with higher scores on the VPCQ obtained a lower FSFI score.

DISCUSSION

This study aimed to assess the effectiveness of a GMI program on pain intensity and sexual function in women diagnosed with GPPPD. A secondary objective was to assess the levels of association between these results and the participants' movement imagery ability and their beliefs and thoughts regarding vaginal penetration. To the best of our knowledge, this is the

first study using a GMI program in this cohort. The GMI program produced significant improvements regarding pain intensity and non-significant improvements regarding sexual function.

While these results appear to align with findings from other studies that have explored the effectiveness of GMI programs in various populations with pain disorders, such as phantom limb pain[22] and Complex Regional Pain Syndrome,[24] further research is needed to confirm these associations and to better understand the specific mechanisms underlying the observed effects in our study population.

As using mirror therapy in the pelvic area for the third phase of the program is challenging, a gradual exposure therapy was used instead. Gradual exposure is the fourth step in a GMI program as described in previous studies and suggested by developers of the GMI program.[16,32] Gradual exposure therapy has demonstrated its effectiveness in addressing various pelvic floor dysfunctions, including chronic pelvic pain[23] and interstitial cystitis.[33] Van Lankveld et al[34] employed gradual exposure therapy in a sample of women diagnosed with vaginismus showing positive results. The protocol for the gradual exposure therapy phase in this study was developed using Masters & Johnson's Sensate Focus exercises[27] where participants were asked to progress from self-exploration and non-genital touching, to genital touching and sexual intercourse. These exercises are designed to alleviate pain and pain-related outcomes by emphasizing on bodily sensations, as suggested in previous studies.[2,11] Directing attention towards touch minimizes the opportunity for anxiety-inducing thoughts that may arise during intercourse, mitigating potential negative distractions. Through gradual exposure therapy, participants are guided to confront and manage their emotions, progressively becoming desensitized to stimuli as they advance to more anxiety-provoking exercises.[27] Our study suggests that this approach may have contributed to reductions in pain intensity levels among participants. However, the efficacy of this intervention should be interpreted cautiously, as additional factors may have influenced these outcomes.

The analysis of sexual function revealed non-significant improvements in the GMI group, while participants in the control group displayed a trend towards deterioration. This nuanced finding underscores the complexity of sexual function. The primary focus of the GMI program is the desensitization of the central nervous system, thus it does not directly address the multifaceted nature of sexual function. In light of this, complementary therapies, such as Cognitive-Behavioral Therapy (CBT), have been proposed for managing sexual function in

patients with pelvic pain. CBT, which emphasizes gradual exposure techniques and addresses psychological components through relaxation techniques and education, has shown positive outcomes in previous studies in women with pelvic pain.[13,14,34,35] Incorporating CBT alongside GMI may offer a more comprehensive approach to addressing the behavioral aspects of sexual function. As there has been a paradigm shift from a symptom-oriented approach to a more person-centered perspective, future investigations could explore the synergistic effects of combining GMI with CBT to optimize outcomes in pelvic pain management.

While our study aimed to assess the effectiveness of the GMI program, it's important to note that a greater proportion of participants in the control group reported receiving treatment during the study period. This could potentially confound our results, as improvements observed in the control group may have been influenced by outside treatment.

Limitations of this study include the relatively brief implementation period, lasting a total of 6 weeks, which may have limited the observed effects on sexual function. Future studies with longer intervention periods are warranted to assess sustained outcomes. Additionally, the exact denominator of potential participants reached during recruitment was not systematically tracked, which precludes a precise calculation of the completion rate. Furthermore, the absence of a comparison to conventional pelvic floor physical therapy limits our ability to evaluate the relative effectiveness of the online program.

It is important to note that follow-up data was not collected immediately after the intervention period. This makes it challenging to determine whether observed changes in outcomes are solely due to the intervention or if they could be influenced by other factors over time. These limitations highlight the need for future research to address these issues and provide more comprehensive insights into the effectiveness of online interventions.

Future studies could consider exploring participant perceptions of online interventions using a combination of quantitative measures, such as validated scores, and qualitative methods, such as open-ended survey responses. These complementary approaches may provide a more comprehensive understanding of the effectiveness and acceptability of online interventions. Additionally, randomized trials comparing online versus in-person interventions could further investigate their effectiveness. Moreover, conducting trials with durations longer than the proposed 6 weeks in our study would offer valuable insights into the sustainability and long-term effectiveness of online interventions.

Viewing pain-related images alone has been shown to induce anticipatory pain and anxiety in women with GPPPD. Kelly et al[6] exposed women with GPPPD to genital-related images and compared the results with those of women without pain. They found that women experiencing pain reported higher levels of anxiety and anticipatory levels of pain. The authors suggested that a gradual exposure to images depicting potentially painful activities might benefit women with GPPPD. Building on the assumption that still images can evoke substantial anticipatory anxiety and pain, and considering the findings of a study that demonstrated reduced pain symptoms in interstitial cystitis using auditory-guided imagery,[33] this study incorporated audio elements during the explicit motor imagery phase. Instead of presenting visual images, participants were asked to listen to and imagine potentially painful activities. We hypothesized that this approach could yield a less anxiety-provoking response in women with GPPPD, as they could halt the audio at any point if they began to feel triggered. Exposure was administered progressively, commencing with the least anxiety-inducing activity, and advancing to the most anxiety-inducing activity—penetrative intercourse. Consequently, this exercise holds promise for desensitization.[19]

The correlation analysis yielded significant association levels between movement imagery ability and pain in the GMI group. As corticospinal excitability has been closely related to motor imagery[36] and is also associated with the development of persistent pain states, it seems relevant to consider the participant's movement imagery ability to ensure effectiveness when implementing interventions such as GMI. Furthermore, a significant correlation between beliefs and thoughts regarding vaginal penetration and sexual function was observed in the control group. However, considering that women with GPPPD usually report higher levels of negative beliefs and thoughts regarding vaginal penetration,[37] and that baseline mean scores for the VPCQ are considerably higher in the control group (64.8 points, SD 15.5) than in the GMI group (59 points, SD 11.6), this association might be reasonably explained and considered circumstantial.

In conclusion, our online program offers a promising solution for women with GPPPD, overcoming barriers such as limited access to specialized physical therapists and societal stigma surrounding face-to-face therapy. By providing an accessible online intervention that offers a convenient option for managing GPPPD and improving quality of life.

Author Contributions

Aida Lopez-Brull (Conceptualization [Equal], Investigation [Equal], Methodology [Equal], Writing - original draft [Equal]), Borja Perez-Dominguez (Conceptualization [Equal], Formal analysis [Equal], Supervision [Equal], Validation [Equal], Visualization [Equal], Writing - review & editing [Equal]), Maria Plaza-Carrasco (Investigation [Equal], Methodology [Equal]), Cristina Blasco-Ortiz (Data curation [Equal], Investigation [Equal], Methodology [Equal]), Blanca Navarro-Ribera (Data curation [Equal], Investigation [Equal], Methodology [Equal]), Jose Casaña (Resources [Equal], Supervision [Equal], Writing - review & editing [Equal]), Esther Diaz Mohedo (Resources [Equal], Software [Equal]), Irmina Nahon (Conceptualization [Equal], Supervision [Equal], Writing - review & editing [Equal].

Ethics Approval

The protocol for this clinical trial was approved by the Ethics Committee of the University of Valencia (reference no. 1741806).

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Clinical Trial Registration

This trial was prospectively registered in an international public registry, ClinicalTrials (no. NCT05637502).

Disclosures

The authors completed the ICMJE Form for Disclosure of Potential Conflicts of Interest and reported no conflicts of interest.

Data Availability: Data obtained in this study will be made available by contacting with the corresponding author upon reasonable request.

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TABLES

Table 1. Baseline Demographic Characteristics of the Participants[a]

Demographic	GMI Group (n = 42)	Control Group (n = 41)	Total (n = 83)
Age, y (SD)	35.6 (10.6)	35.5 (9.9)	35.5 (10.2)
Educational level, n (%)			
Early childhood education	0 (0%)	0 (0%)	0 (0%)
Primary	0 (0%)	0 (0%)	0 (0%)
Lower secondary	1 (2.4%)	0 (0%)	1 (1.2%)
Upper secondary	3 (7.1%)	2 (4.9%)	5 (6%)
Post-secondary non-tertiary	1 (2.4%)	5 (12.2%)	6 (7.2%)
Short cycle tertiary	6 (14.3%)	7 (17.1%)	13 (15.7%)
Bachelor's or equivalent	15 (35.7%)	15 (36.6%)	30 (36.1%)
Master's or equivalent	16 (38.1%)	10 (24.4%)	26 (31.3%)
Doctoral or equivalent	0 (0%)	2 (4.9%)	2 (2.4%)
Marital status, n (%)			
Single (unpartnered)	7 (16.7%)	4 (9.8%)	11 (13.3%)
Single (partnered)	19 (45.2%)	20 (48.8%)	39 (47%)
Married	16 (38.1%)	17 (41.5%)	33 (39.8%)
Receives treatment, n (%)			
Yes	14 (33.3%)	20 (48.8%)	34 (41%)
No	28 (66.7%)	21 (51.2%)	49 (59%)
CPPQ, points (SD)	18.2 (3.7)	17.5 (4.4)	17.8 (4.1)
MIQ-R, points (SD)	80.3 (17.3)	83.3 (19.7)	81.8 (18.5)
VPCQ, points (SD)	59 (11.6)	64.8 (15.5)	61.9 (13.9)

[a]CPPQ = chronic pelvic pain questionnaire; GMI = graded motor imagery; MIQ-R = movement imagery

questionnaire revised; VPCQ = vaginal penetration cognition questionnaire.

Table 2. Results of a Mix-Design Two-Way Repeated Measure ANOVA[a]

Outcome	Group	Mean (SD)		Time, *P*	Effect Size	Group-Time, *P*	Effect Size
		PRE	POST				
VAS, points (SD)	GMI	6.9 (1.3)	4.7 (1.3)	*F* = 41.586	$\eta_p^2 = 0.339$	*F* = 25.393	$\eta_p^2 = 0.239$
	Control	6.9 (1.5)	6.7 (1.5)	*P* < .05		*P* < .05	
FSFI, points (SD)	GMI	16.5 (3.9)	16.6 (3.7)	*F* = 0.198	$\eta_p^2 = 0.002$	*F* = 0.820	$\eta_p^2 = 0.010$
	Control	16.1 (4.6)	15.5 (4.7)	*P* = .66		*P* = .37	

[a] ANOVA = analysis of variance; FSFI = female sexual function index; GMI = graded motor imagery; VAS = visual analogue scale.

Table 3. Results of the Correlation Analysis Between Results and Participant's Age, Ability to Imagine, and Cognitions About Vaginal Penetration[a]

		GMI Group		Control Group	
Variable		Pearson's correlation index	*P*	Pearson's correlation index	*P*
Age	VAS	0.013	.47	0.106	.26
	FSFI	-0.049	.38	0.004	.49
MIQ-R	VAS	-0.328	<.05	0.040	.40
	FSFI	0.142	.19	0.109	.25
VPCQ	VAS	0.234	.07	0.256	.05

FSFI	−0.205	.10	−0.412	<.05

[a]FSFI = female sexual function index; GMI = graded motor imagery; MIQ-R = movement imagery questionnaire revised; VAS = visual analogue scale; VPCQ = vaginal penetration cognition questionnaire.

FIGURE LEGEND

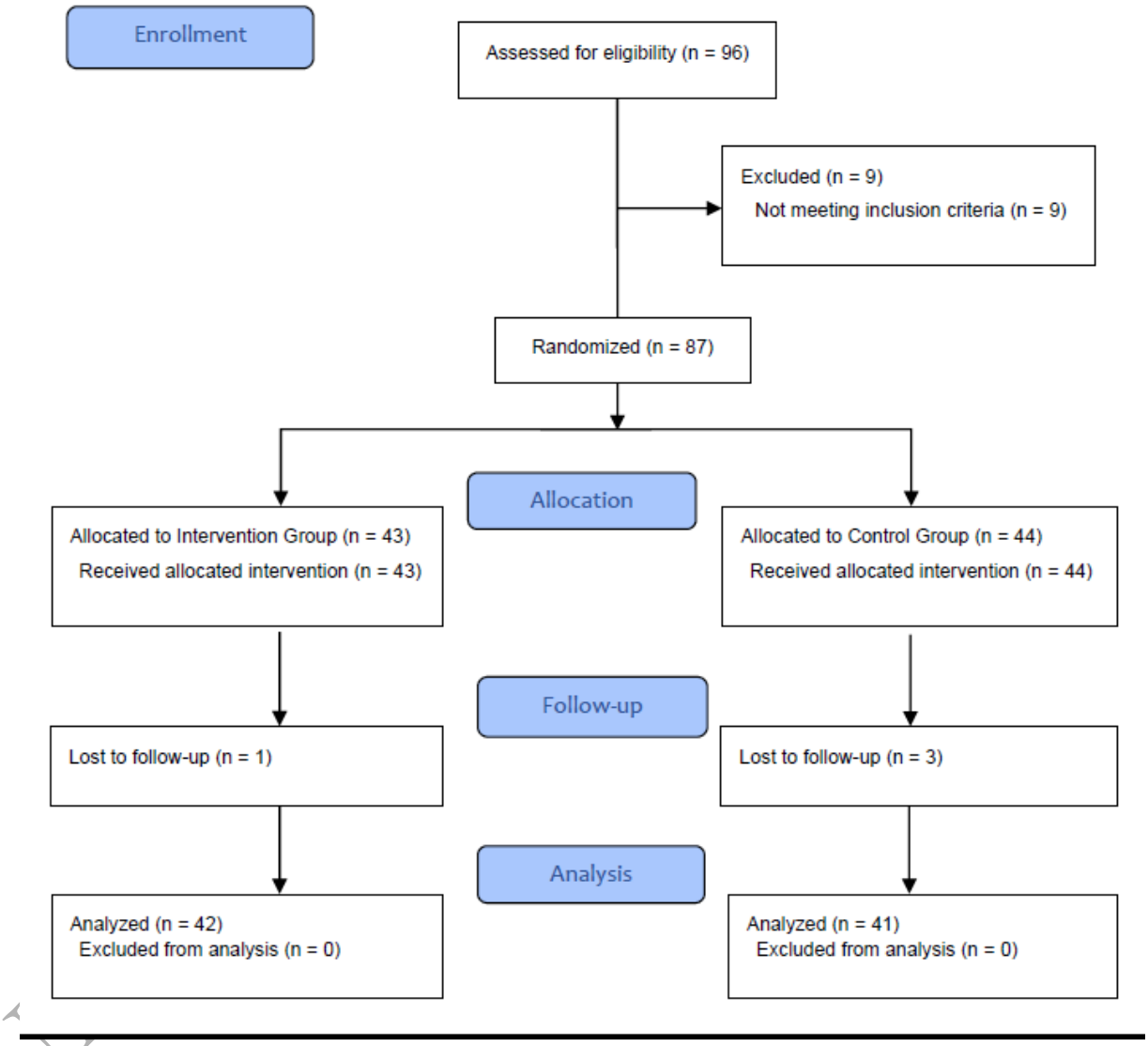

Figure 1. Participant flow diagram.

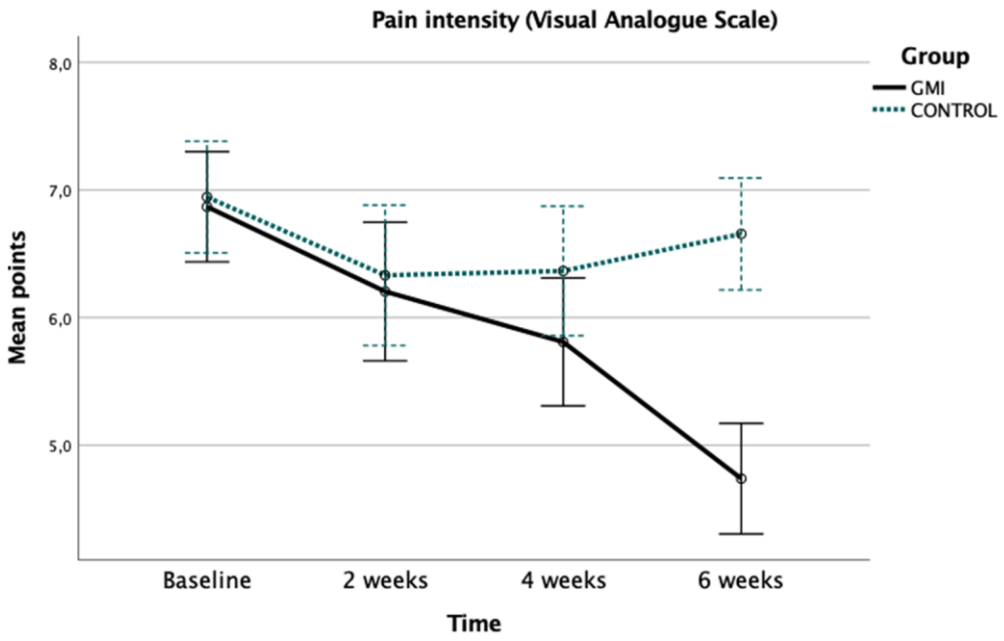

Figure 2. Changes in time for pain intensity. GMI = graded motor imagery.

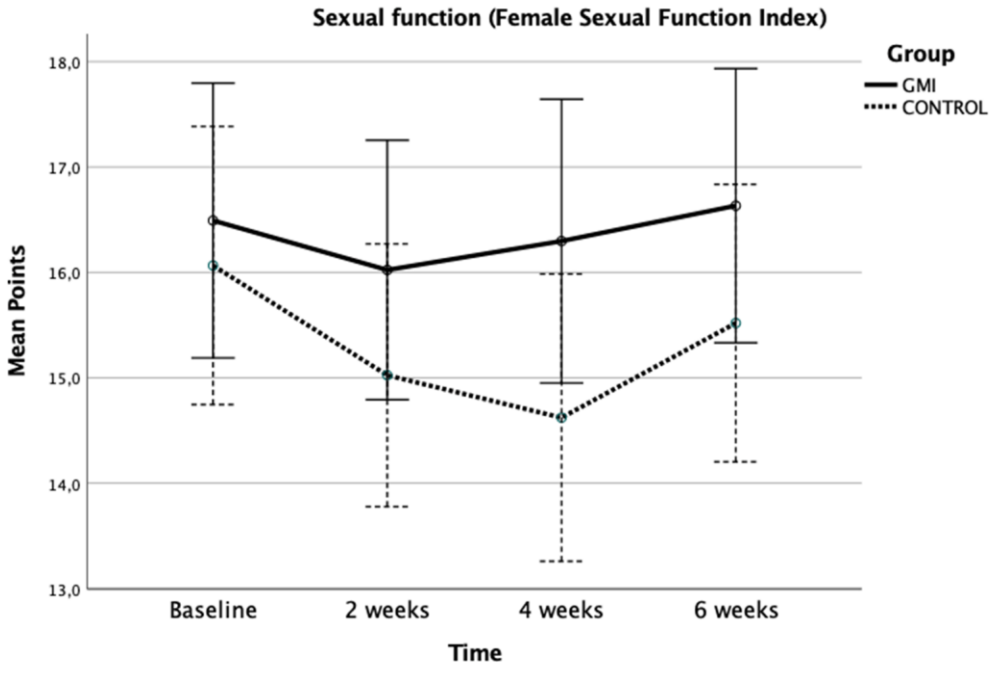

Figure 3. Changes in time for sexual function. GMI = graded motor imagery.