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CONSERVATIVE MANAGEMENT OF PATIENTS WITH DYSFUNCTIONAL PAIN IN THE PELVIC FLOOR

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Que el presente trabajo, titulado:

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Ha sido realizado bajo nuestra tutela por **Aida López Brull** para la obtención del título de Doctora por la Universitat de València.

Habiendo concluido, y reuniendo las condiciones de originalidad y rigor científico necesarias, autorizamos su presentación para que pueda ser defendida ante el tribunal correspondiente.

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DEDICATORY

To my family,

To Borja,

To Mya

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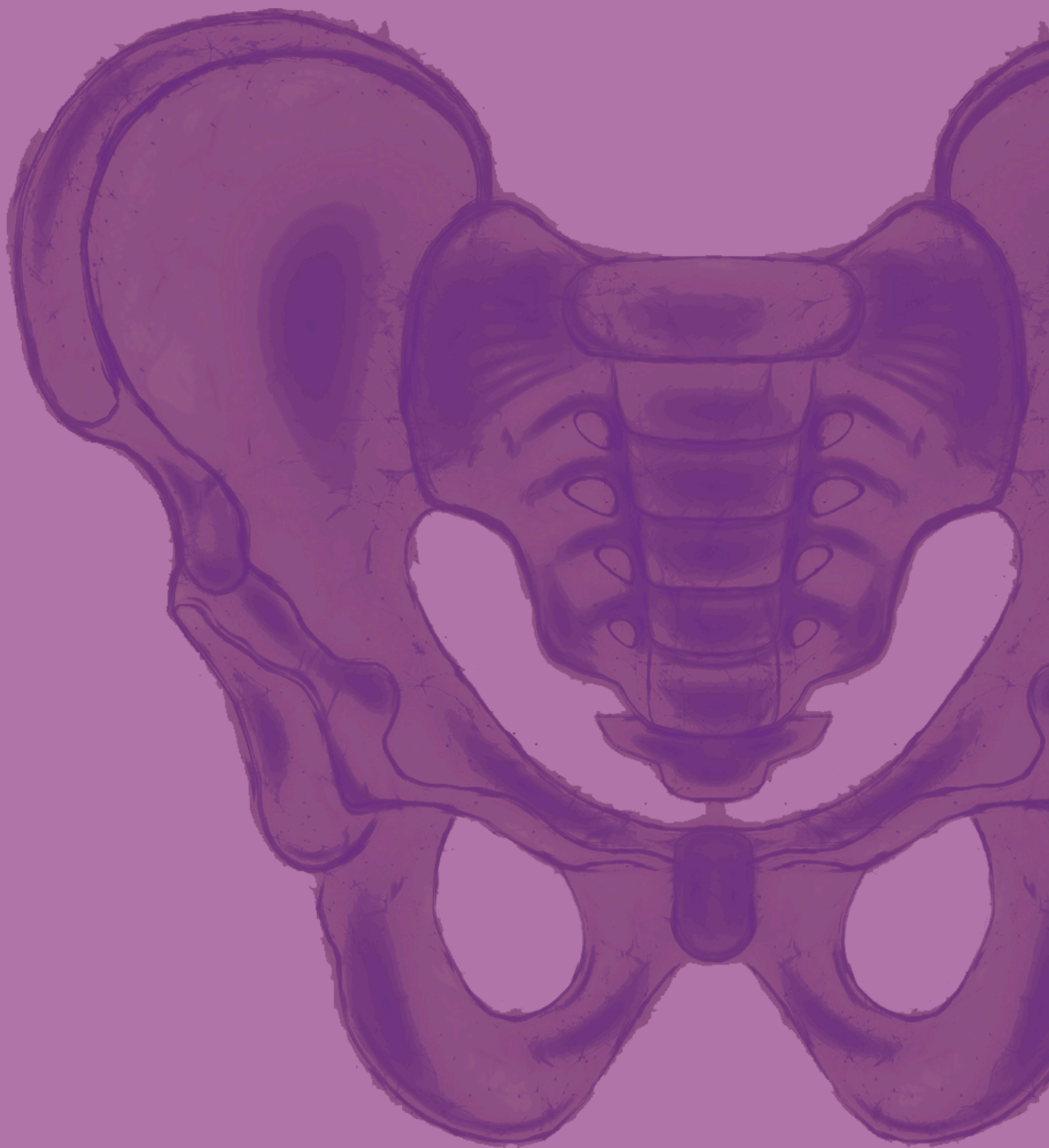

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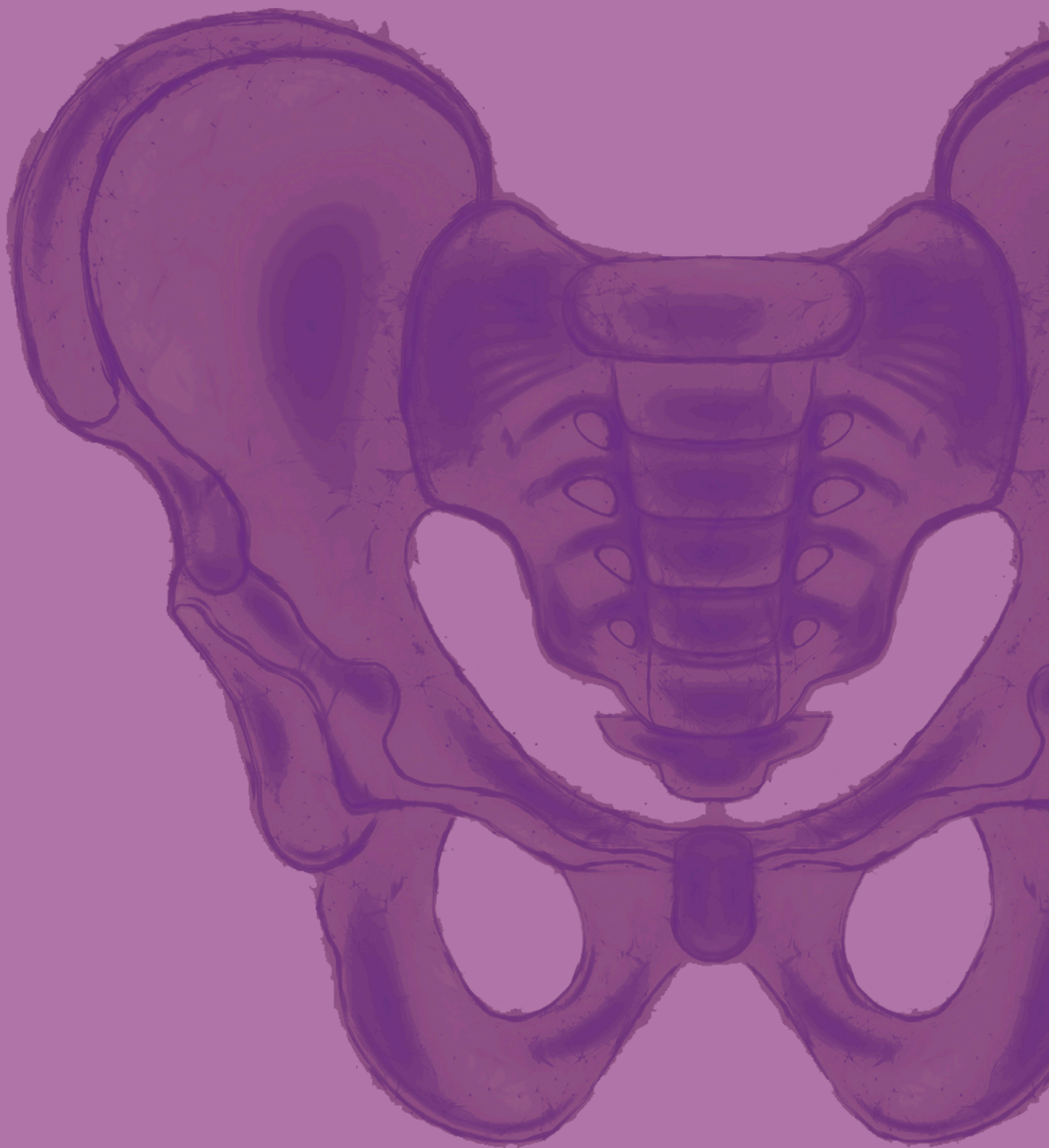
LIST OF ACRONYMS

AVE: Average Variance Extracted
CBT: Cognitive Behavioral Therapy
CG: Control Group
CNS: Central Nervous System
CPP: Chronic Pelvic Pain
DSM-5: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
EFA: Exploratory Factor Analysis
FSFI: Female Sexual Function Index
FSFI-6: Female Sexual Function Index-Short Version
GMI: Graded Motor Imagery
GPPPD: Genito-Pelvic Pain/Penetration Disorder
GQS: Global Quality Scale
IASP: International Association for the Study of Pain
ICC: Intraclass Correlation Coefficient
INE: Spanish National Institute of Statistics
ISCED: International Standard Classification of Education
KMO: Kaiser-Meyer-Olkin
MIQ-R: Movement Imagery Questionnaire-Revised
MSV: Maximum Squared Shared Variance
OG: Online Group
PCA: Principal Component Analysis
PC: Pain Catastrophizing
PCS: Pain Catastrophizing Scale
PMT: Pelvic Floor Muscle Training
PNE: Pain Neuroscience Education
QUEST: Quality Evaluation Scoring Tool
SD: Standard Deviation
SEM: Standard Error of Measurement
SIAD: Sexual Interest/Arousal Disorder
SOPA-B: Survey of Pain Attitudes-Brief Version
VAS: Visual Analogue Scale
VPQC: Vaginal Penetration Cognition Questionnaire
VPI: Video Power Index
WHO: World Health Organization

ABSTRACT



Resumen

Introducción: Según la OMS, la salud sexual es fundamental para la salud general del individuo. Las relaciones sexuales no deberían causar dolor; sin embargo, para muchas mujeres, sí lo hacen, lo que puede tener un impacto significativo en su bienestar y sus relaciones íntimas. El dolor durante las relaciones sexuales se describe con diferentes términos en la literatura. Los términos "dispareunia" y "vaginismo" se consideraban distintos, pero el Diagnostic and Statistical Manual of Mental Disorders, en su quinta edición (DSM-5) los ha unido bajo el término "Trastorno de Dolor/Penetración Genitopélvico" (GPPPD, por sus siglas en inglés). El GPPPD es una disfunción sexual común en mujeres, diagnosticada cuando el dolor es persistente o recurrente en al menos uno de los siguientes criterios: 1) dificultad persistente o recurrente durante la penetración vaginal, 2) dolor vaginal o pélvico durante o con el intento de penetración, 3) miedo o ansiedad al dolor vaginal o pélvico antes, durante o después de la penetración, y 4) hipertonicidad de la musculatura del suelo pélvico antes o durante la penetración. Estas condiciones deben estar presentes durante al menos 6 meses y no tener una causa médica que explique el dolor.

Aunque se desconoce la causa exacta, la evidencia sugiere una etiología multifactorial, relacionándola con factores psicológicos y personales. Estos factores pueden ser biológicos, psicológicos, culturales o interpersonales. Además, el GPPPD puede clasificarse como un dolor persistente, compartiendo características con condiciones de curso similar como la fibromialgia o el dolor regional complejo. La causa inicial del dolor puede ser biológica, pero puede persistir incluso en ausencia de una causa médica o patológica. Similar a otros dolores persistentes, las mujeres con GPPPD presentan cambios a nivel del sistema nervioso central, conocidos como cambios nociplásticos. Después de un episodio agudo de dolor, en el sistema nervioso central ocurren cambios nociplásticos, resultando en una amplificación de la señal dolorosa, también conocida como sensibilización central.

Dada su etiología multifactorial, el tratamiento adecuado según la evidencia es un tratamiento multidisciplinar, incorporando tratamientos médicos, psicológicos y de fisioterapia. Entre los tratamientos de fisioterapia se incluyen la electroestimulación, trabajo con biofeedback, técnicas miofasciales, relajación de la musculatura del suelo pélvico, educación y exposición gradual con dilatadores, entre

otros. Se ha demostrado que una combinación de varios de estos tratamientos ha dado los mejores resultados en cuanto al dolor.

En otros trastornos de dolor persistente se ha demostrado que la educación en neurociencias del dolor reduce los niveles de dolor. Mediante la educación, las mujeres cambian su actitud frente al dolor y reducen pensamientos catastróficos. Aunque no esté ampliamente estudiada en el GPPPD, la educación tiene un potencial en disminuir el dolor, dada la hipervigilancia y catastrofismo que estas mujeres presentan. Además, otra terapia muy utilizada en dolores persistentes es la Imaginería Motora Graduada. Actualmente no hay estudios en mujeres con GPPPD, pero sí hay evidencia de implementar una de sus fases en dolor pélvico crónico, al igual que hacer exposición gradual en mujeres con vaginismo y dolor pélvico.

Objetivos: El objetivo del primer estudio es analizar la calidad de los videos encontrados en YouTube sobre el término "dispareunia". El segundo estudio trata de establecer los niveles de correlación entre los resultados de un programa terapéutico de educación en neurociencias del dolor y el estatus socioeconómico de las participantes. El objetivo del tercer estudio es analizar los resultados del mismo programa terapéutico de educación en neurociencias del dolor sobre todos los dominios del cuestionario Female Sexual Function Index. El cuarto estudio tiene como objetivo traducir y validar el cuestionario Vaginal Penetration Cognition Questionnaire al español. Por último, el quinto estudio analiza la efectividad de un programa de Imaginería Motora Graduada en mujeres con GPPPD en cuanto al dolor y la función sexual.

Materiales y método:

Estudio I: Se realizó un estudio observacional en febrero de 2021 llevando a cabo una búsqueda en YouTube con el término "dispareunia". Los primeros 150 videos fueron analizados cualitativamente por dos investigadores independientes. La calidad de los videos se evaluó utilizando los instrumentos DISCERN, Global Quality Scale (GQS) y Quality Evaluation Scoring Tool (QUEST), y la popularidad se midió con el Video Popularity Index (VPI).

Estudio II: Se establecieron los niveles de correlación existentes entre los resultados de un programa terapéutico de educación en neurociencias del dolor y el estatus socioeconómico de las participantes, considerando su edad, nivel educativo, nivel de ingresos mensuales en el hogar y ocupación. El análisis de la correlación se estableció mediante el índice de correlación de Pearson para variables cuantitativas y la rho de Spearman para variables cualitativas.

Estudio III: En un ensayo controlado aleatorizado, participantes diagnosticadas de GPPPD recibieron un programa terapéutico de educación en neurociencias del dolor. Se analizó el Female Sexual Function Index (FSFI) y se realizó un análisis del cambio en cada dominio del cuestionario, analizando el cambio en el tiempo de cada ítem mediante múltiples pruebas t.

Estudio IV: Se realizó una traducción y se analizaron las propiedades psicométricas de la versión en español del Vaginal Penetration Cognition Questionnaire (VPCQ-Sp). Mujeres diagnosticadas de GPPPD respondieron al cuestionario, y se analizó la validez, fiabilidad y la consistencia interna del mismo.

Estudio V: En un ensayo controlado aleatorizado, mujeres con GPPPD fueron asignadas a un grupo sometido a un programa de Imaginería Motora Graduada adaptado a dolor localizado en el suelo pélvico o un grupo control. El programa de Imaginería Motora Graduada se realizó durante un total seis semanas e incluía ejercicios de discriminación de la lateralidad, estimulación mental del movimiento y exposición gradual. Se evaluaron la intensidad del dolor y la función sexual, además de analizar si las habilidades imaginativas y las creencias sobre la penetración vaginal de estas participantes tuvieron un rol relevante.

Resultados:

Estudio I: Se analizaron un total 150 vídeos, con un promedio de 35.513 visitas, una duración media de 5:39 minutos y un tiempo medio desde su publicación de 1.396,3 días. La media del ratio de visitas fue de 29,8, con 333 "me gusta" y 13 "no me gusta". El VPI fue de 92,1%. La media del instrumento DISCERN fue de 40,9 puntos (investigador 1) y 39,3 puntos (investigador 2). La media de GQS fue de 3,1 puntos (investigador 1) y 3,0 puntos (investigador 2). Los valores medios de QUEST fueron de 13,3 puntos (investigador 1) y 13,1 puntos (investigador 2).

Estudio II: No se encontraron niveles significativos de correlación entre los resultados del programa de educación en neurociencias del dolor y la edad, el nivel educativo, los ingresos mensuales en el hogar y la ocupación de las participantes.

Estudio III: Se encontraron mejoras significativas en el dominio "dolor" del FSFI en el grupo que recibió las sesiones de educación en neurociencias del dolor de modo presencial (-1,1 puntos, DE 1.8, $p<0.05$), y en los dominios "satisfacción" (-0.8 puntos, DE 1.8, $p<0.05$) y "dolor" (-0.8 puntos, DE 1.7, $p<0.05$) del FSFI en el grupo que recibió las sesiones de modo online.

Estudio IV: La versión en español del Vaginal Penetration Cognition Questionnaire demostró ser válida, fiable y consistente en mujeres con GPPPD. El análisis factorial exploratorio reveló un total de cuatro dominios con un 62.5% de varianza. La validez convergente y discriminativa fue confirmada. La fiabilidad test-retest fue alta, con un coeficiente de correlación intraclase de 0.9. Cada dominio mostró buenos niveles de consistencia interna, con un α de Cronbach entre 0.84 y 0.89.

Estudio V: El grupo que recibió sesiones de Imaginería Motora Graduada mostró una reducción significativa en la intensidad del dolor (de 6,9 puntos, DE 1,3 a 4,7 puntos, DE 1,3, $p<0,05$). Los participantes con buenas habilidades imaginativas tuvieron un nivel mayor de mejora, mientras que aquellas con peores creencias negativas sobre la penetración vaginal mostraron un nivel menor de mejoras en la función sexual.

Conclusiones:

Estudio I: La calidad en general de los videos sobre dispareunia en YouTube es aceptable según los instrumentos DISCERN, GQS y QUEST. Los videos publicados por instituciones académicas son los de mayor calidad, aunque no son los más populares, contrario a aquellos producidos por medios de comunicación.

Estudio II: El programa terapéutico de educación en neurociencias del dolor es efectivo respecto a la intensidad de dolor y la función sexual en mujeres diagnosticadas con GPPPD, independientemente de su edad, nivel de estudios, ingresos mensuales en el hogar u ocupación.

Estudio III: El programa terapéutico de educación en neurociencias del dolor no es capaz de producir una mejora significativa general en el FSFI, pero sí que mejora significativamente algunos de los dominios del mismo, como el de "dolor" o el de "satisfacción".

Estudio IV: La versión española del Vaginal Penetration Cognition Questionnaire es una herramienta válida, fiable y consistente para analizar las creencias sobre la penetración vaginal en mujeres con GPPPD.

Estudio V: Un programa de Imaginería Motora Graduada adaptado al dolor localizado en el suelo pélvico es efectivo para disminuir significativamente el dolor y mejorar de manera no significativa la función sexual en mujeres diagnosticadas de GPPPD.

Abstract

Introduction: According to the World Health Organization (WHO), sexual health is fundamental to an individual's overall health. Sexual intercourse should not be painful; however, for many women, pain significantly impacts their well-being and intimate relationships. Pain during sexual intercourse is described with various terms in the literature. The terms "dyspareunia" and "vaginismus" were once considered distinct, but the Diagnostic and Statistical Manual of Mental Disorders, in its Fifth Edition (DSM-5) has combined them under the term "Genito-Pelvic Pain/Penetration Disorder" (GPPPD). GPPPD is a common sexual dysfunction in women, diagnosed when pain is persistent or recurrent and at least one of the following criteria are present: 1) persistent or recurrent difficulty with vaginal penetration, 2) vaginal or pelvic pain during or at the attempt of penetration, 3) fear or anxiety about vaginal or pelvic pain before, during, or after penetration, and 4) hypertonicity of the pelvic floor muscles before or during penetration. These conditions must be present for at least six months and not have a medical cause that explains the pain.

Although the exact cause is unknown, evidence suggests a multifactorial etiology, involving psychological and personal factors. These factors can be biological, psychological, cultural, or interpersonal. Additionally, GPPPD can be classified as a persistent pain condition, sharing characteristics with other conditions such as fibromyalgia or complex regional pain syndrome. The initial cause of the pain may be biological, but it can persist even in the absence of a medical or pathological cause. Similar to other persistent pain conditions, women with GPPPD exhibit changes at the central nervous system level, known as nociplastic changes. After an acute pain episode, nociplastic changes occur in the central nervous system, resulting in an amplification of the pain signal, also known as central sensitization.

Given its multifactorial etiology, the appropriate treatment according to evidence is a multidisciplinary approach, incorporating medical, psychological, and physiotherapy treatments. Physiotherapy treatments include electrostimulation, biofeedback, myofascial release techniques, pelvic floor muscle relaxation, education, and gradual exposure with dilators, among others. It has been shown that various combined physiotherapy treatments yield the best results in terms of pain.

In other persistent pain disorders, Pain Neuroscience Education (PNE) has been shown to reduce pain levels. Through education, women change their attitudes towards pain and reduce catastrophic thoughts. Although not extensively studied in GPPPD, education has the potential to reduce pain, given the hypervigilance and catastrophizing these women exhibit. Additionally, another well-utilized therapy in persistent pain is Graded Motor Imagery (GMI). Currently there are no studies implementing GMI in women with GPPPD, but there is evidence for implementing one of its phases in chronic pelvic pain, as well as gradual exposure in women with vaginismus and chronic pelvic pain.

Objectives: The objective of the first study is to analyze the quality of YouTube videos on the term "dyspareunia". The objective of the second study is to establish the levels of correlation between the outcomes of a Pain Neuroscience Education program and the participants' socioeconomic status. The third study examines the outcomes of the same Pain Neuroscience Education program across all domains of the Female Sexual Function Index questionnaire. The fourth study aims to translate and validate the Vaginal Penetration Cognition Questionnaire into Spanish. Finally, the fifth study analyzes the effectiveness of a Graded Motor Imagery program in women with GPPPD in terms of pain and sexual function.

Materials and Method:

Study I: An observational study was conducted in February 2021 by searching YouTube with the term "dyspareunia." The first 150 videos were retrieved and qualitatively analyzed by two independent researchers. The quality of the videos was assessed using the DISCERN, Global Quality Scale (GQS), and Quality Evaluation Scoring Tool (QUEST), and their popularity was measured with the Video Popularity Index (VPI).

Study II: The correlation levels between the outcomes of a Pain Neuroscience Education program and the socioeconomic status of the participants were established, considering their age, educational level, household monthly income, and occupation. The correlation analysis was conducted using Pearson's correlation coefficient for quantitative variables and Spearman's rho for qualitative variables.

Study III: In a randomized controlled trial, participants diagnosed with GPPPD received a Pain Neuroscience Education program. The Female Sexual Function Index (FSFI) was analyzed across all of its domains, and changes in each questionnaire item were assessed using multiple t-tests.

Study IV: The Spanish version of the Vaginal Penetration Cognition Questionnaire (VPCQ-Sp) was developed and its psychometric properties were analyzed. Women diagnosed with GPPPD completed the questionnaire, and its validity, reliability, and internal consistency were assessed.

Study V: In a randomized controlled trial, women with GPPPD were assigned to either a group undergoing a Graded Motor Imagery program adapted for localized pelvic floor pain or a control group. The Graded Motor Imagery program was conducted over six weeks and included laterality discrimination exercises, mental movement stimulation, and gradual exposure. Pain intensity and sexual function were assessed, and the potential roles of the ability to imagine and negative beliefs about vaginal penetration in these participants were analyzed.

Results:

Study I: A total of 150 videos were analyzed, with an average of 35,513 views, an average duration of 5:39 minutes, and an average time since publication of 1,396.3 days. The average view ratio was 29.8, with 333 "likes'' and 13 "dislikes". The VPI was 92.1%. The average DISCERN score was 40.9 points (Researcher 1) and 39.3 points (Researcher 2). The average GQS was 3.1 points (Researcher 1) and 3.0 points (Researcher 2). The average QUEST scores were 13.3 points (Researcher 1) and 13.1 points (Researcher 2).

Study II: No significant correlation levels were found between the outcomes of the Pain Neuroscience Education program and the participants' age, educational level, household monthly income, and occupation.

Study III: Significant improvements were found in the "pain" domain of the FSFI in the group that received in-person Pain Neuroscience Education sessions (-1.1 points, SD 1.8, $p<0.05$), and in the "satisfaction" (-0.8 points, SD 1.8, $p<0.05$) and "pain" (-0.8 points, SD 1.7, $p<0.05$) domains of the FSFI in the group that received online sessions.

Study IV: The Spanish version of the Vaginal Penetration Cognition Questionnaire was found to be valid, reliable, and consistent in women with GPPPD. Exploratory factor analysis revealed a total of four domains with 62.5% variance. Convergent and discriminant validity were confirmed. Test-retest reliability was high, with an intraclass correlation coefficient of 0.9. Each domain showed good levels of internal consistency, with Cronbach's α between 0.84 and 0.89.

Study V: The group that received Graded Motor Imagery sessions showed a significant reduction in pain intensity (from 6.9 points, SD 1.3 to 4.7 points, SD 1.3, $p<0.05$). Participants with good imaginative abilities had greater improvements, while those with higher negative beliefs about vaginal penetration showed fewer improvements in sexual function.

Conclusions:

Study I: The overall quality of YouTube videos on dyspareunia is acceptable according to the DISCERN, GQS, and QUEST tools. Videos published by academic institutions are of the highest quality, although they are not the most popular, unlike those produced by media outlets.

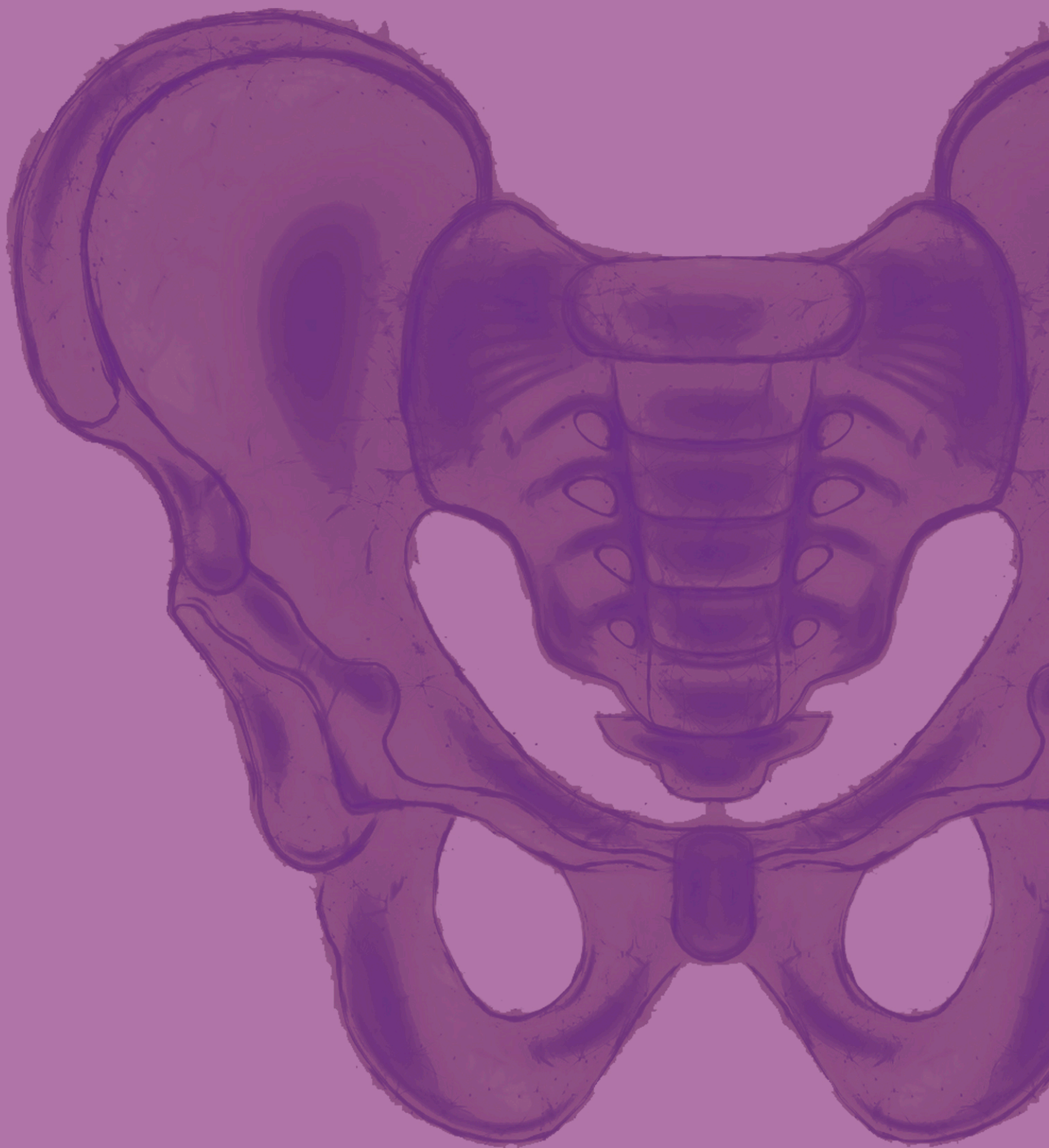
Study II: The Pain Neuroscience Education program is effective in reducing pain intensity and improving sexual function in women diagnosed with GPPPD, regardless of their age, educational level, household monthly income, or occupation.

Study III: The Pain Neuroscience Education program does not produce a significant improvement in the FSFI overall, but does significantly improve some of its domains, such as "pain" and "satisfaction."

Study IV: The Spanish version of the Vaginal Penetration Cognition Questionnaire is a valid, reliable, and consistent tool for analyzing cognitions about vaginal penetration in women with Genito-Pelvic Pain/Penetration Disorder.

Study V: A Graded Motor Imagery program is effective in improving significantly pain intensity and non-significantly sexual function in women diagnosed with Genito-Pelvic Pain/Penetration Disorder.

Chapter 1.
INTRODUCTION



1. Introduction

1.1. Introduction to Genito-Pelvic Pain/Penetration Disorder

According to the World Health Organization (WHO), sexual health is fundamental to an individual's overall health. Sexual health requires a respectful approach to sexual relationships as well as the possibility of pleasurable and safe sexual experiences (1).

Social discomfort around discussing sexual health has kept us from recognizing how the most natural human behavior can face complexities. Among these complications is the problem of pain, particularly during vaginal penetration. Despite individual variations in sexual satisfaction, persistent pain during intercourse sets a clear boundary. Sexual intercourse is not supposed to hurt, but it does for many women and can significantly impact their well-being and intimate relationships. This issue becomes serious when health care professionals fail to manage this condition due to a lack of awareness. The treatment of sexual pain has a similar history to that of other persistent pain syndromes, compounded by the complication of sexual stigma (2).

1.1.1. Terminology

The terminology of sexual dysfunctions lacks uniformity and presents a challenge for health care professionals (3). Painful intercourse is the earliest documented female sexual dysfunction, first recorded in an Ancient Egyptian document translated in the 18th century. Then, moving forward to the 1860s, the term “vaginismus” appeared, even though its symptoms had been described for many years. Later, in the 1930s, the term “dyspareunia” was used to refer to painful intercourse. Dyspareunia comes from the Ancient Greek meaning “difficult mating” (2). The definition of dyspareunia is a complaint of persistent or recurrent pain or discomfort associated with attempted or complete vaginal penetration. The term “vaginismus” refers to a recurrent or persistent spasm of vaginal muscles that interferes with vaginal penetration (3).

Nowadays, there is a wide range of terminology describing genital pain. Different terms are currently used by health professionals to describe penetration pain, such as provoked or generalized vulvodynia, vulvar vestibulitis, dyspareunia, vaginismus, pelvic pain, or sexual pain (2). The Diagnostic and Statistical Manual of

Mental Disorders, Fifth Edition (DSM-5), combines both sexual dysfunctions, dyspareunia and vaginismus, into the term Genito-Pelvic Pain/Penetration Disorder (GPPPD) (4).

Even though we now have the term GPPPD, most researchers still use dyspareunia or vaginismus when referring to pain during intercourse. This can explain the challenge when searching for prevalence, etiology, or treatment management in scientific journals; each researcher might use different terminology to refer to the same problem. This short introduction on terminology is to ensure there is no confusion when reading this thesis. The term used to refer to pain during intercourse will be GPPPD, but some citations might use other terminology.

1.1.2. Concept

GPPPD is a common sexual dysfunction where women experience pain in the attempt of, during, or after sexual intercourse. It is categorized as a sexual dysfunction in the DSM-5. To diagnose GPPPD, pain must be persistent or recurrent, and at least one of the following conditions must be met: 1) persistent or recurrent difficulties during vaginal penetration, 2) vaginal or pelvic pain during intercourse or the attempt of intercourse, 3) marked fear or anxiety about vulvovaginal or pelvic pain in anticipation of, during, or because of vaginal penetration, or 4) marked hypertonicity of pelvic floor muscles during intercourse or the attempt of intercourse. Additionally, symptoms must be present for at least six months and cause significant associated distress. These conditions must not be better explained by a non-sexual mental disorder, severe relationship conflict (such as gender-based violence), the effects of any substance or medication, or any medical condition. GPPPD may be present from when the individual reaches sexual maturity or may be acquired after a period of relatively normal sexual activity due to an external factor. These common sexual dysfunctions can affect the patient and their partner sexually, psychologically, and in their relationship.

1.1.3. Prevalence

Female sexual disorders are a major health concern for women of all ages and populations. Despite significant advances in this field, only 60% of women with sexual problems receive treatment, and 52% of those do not receive a correct diagnosis (5). GPPPD can affect 14-34% of pre-menopausal women and up to 45%

of post-menopausal women (5). Research shows a variety of prevalence figures worldwide, which may be due to differences in concepts, definitions, diagnostic criteria, and cultural or religious factors. The prevalence in the Middle East is 29%, in Turkey 42.9%, and in Spain 11.23% (6,7). This suggests that cultural and religious differences may influence the experience of pain during intercourse.

1.1.4. Etiology and risk factors

GPPPD has a multifactorial and complex etiology, as it is highly associated with psychological and relational well-being. Even if the original cause of pain is identified that cause may not be what maintains it. Sexual pain requires a multifactorial view, and different etiological pathways can lead to its onset and persistence. Initial pain may be triggered by a biomedical condition but can lead to further alterations in pain processing in the central nervous system (5).

The etiological factors can be divided into biological, psychological, cultural/religious, or interpersonal.

Biological factors

Many biomedical factors that lead to sexual pain are caused by inflammation from genital infections such as candidiasis, recurrent yeast infections, or tissue lesions from dermatological diseases such as lichen sclerosus. Hormonal changes in women, such as those occurring during menopause, can lead to vulvovaginal atrophy. Prolonged use of contraceptive pills can also cause morphological changes and increase vulvar sensitivity (5). Malignant disorders and their treatments, such as surgery or radiotherapy, can damage the vulva, resulting in pain (2,8). Muscle structure can also be an etiological factor, particularly hypertonicity of the pelvic floor muscles and weak muscle control. Several studies have shown an increase in resting muscle tone in women with GPPPD. This hypertonicity is associated with a decrease in vaginal vasocongestion, leading to poor genital arousal (2,5,8).

Psychological factors

In addition to biological factors, psychological factors are varied. Women with GPPPD are more likely to have a past history of sexual, physical, or emotional abuse (2). Women with anxiety and depression also appear to suffer more from pain during intercourse. It is important to consider that the pelvic floor is affected by emotions, as anxiety can lead to involuntary contractions of the pelvic floor muscles.

Cognitive and behavioral aspects of sexual intercourse and pain also seem to affect pain intensity. Women with GPPPD often have negative beliefs and expectations about sexuality and pain. This can lead to hypervigilance, avoidance of intimacy, and higher levels of anticipatory anxiety. Pain catastrophizing is also common in persistent disorders such as GPPPD. Catastrophizing is a psychological trait referring to the tendency to magnify pain or feel helpless about it (9). This suggests that there is a relationship between psychological issues and pain disorders.

Cultural/Religious factors

Attitude towards sexuality plays an important role in sexual pain. Family, social media, educational institutions, and religion can influence how women perceive and interact within their sexual environment from a young age. Religious messages can make women internalize feelings of guilt and moral transgression in sexually active women. Sex guilt is present in women suffering from GPPPD who are influenced by religiously conservative environments, and it is associated with more painful sex (10). Among cultural and social factors, repulsion towards looking at or touching the genitals and negative cognitions about sexual stimuli are also associated with higher levels of GPPPD (7).

Interpersonal

When it comes to GPPPD, not only do the women suffer, but their partners do too, and partners play an important role in pain modulation. Negative partner responses have been associated with more pain during intercourse. Partners who are easily enraged by any signs of pain or who lack understanding about the problem are associated with increased pain and more depressive symptoms in women. On the other hand, sexual communication within the relationship is related to greater

satisfaction and, consequently, less pain (2). The fear of pain can lead to penetration avoidance and ultimately to partner avoidance. This affects couples and adds more distress to the woman (7).

1.1.5. Understanding pain in Genito-Pelvic Pain/Penetration Disorder

Genito-Pelvic Pain/Penetration Disorder can be conceptualized as a persistent pain condition, as it shares similar traits with other persistent conditions such as fibromyalgia, Complex Regional Pain Syndrome, or phantom limb pain (11). As mentioned before, the original cause of pain might be a biological condition, such as tissue scar due to birth (nociceptive stimuli), but pain can persist even in the absence of any medical or pathological cause (12). Nociceptive pain is a key process for detecting harmful stimuli using peripheral and central sensory neurons called nociceptors to protect humans. However, maladaptive changes to this process can cause persistent pain (13).

The International Association for the Study of Pain (IASP) classifies pain into:

- Nociceptive pain: Pain caused by tissue damage activating nociceptors, which can be somatic or visceral depending on the type of nociceptors involved
- Neuropathic pain: Pain arising from neurological damage, categorized as central or peripheral depending on the location within the somatosensory nervous system.
- Nociplastic pain: Pain resulting from altered nociceptive processing without clear evidence of ongoing tissue damage.

With persistent or intensified nociceptive stimuli, the nociceptive system becomes sensitized. This lowers the threshold for nociceptor activation and amplifies their response (13). GPPPD predominantly manifests as nociplastic pain. Similar to other persistent pain conditions, individuals diagnosed with GPPPD exhibit changes in both the peripheral and central nervous systems, known as neuroplastic changes. Following an initial acute pain episode, neuroplastic changes occur in the central nervous system, resulting in an amplification of pain known as central sensitization (14). This heightened perception of pain intensity can lead to increased levels of

pain-related fear and anxiety, hypervigilance to pain, and pain catastrophizing (11). According to the DSM-5, "marked fear or anxiety about vulvovaginal or pelvic pain in anticipation of, during, or because of vaginal penetration" is one criterion for diagnosing GPPPD. Neuroplastic changes associated with centralized sensitization have been demonstrated in women with GPPPD (14).

To understand more about the mechanisms of genito-pelvic pain, the fear-avoidance model (Figure 1) can be used to explain the persistence of pain in this disorder. After repeated painful experiences over time, fearful and catastrophic thoughts about pain arise, leading to somatic hypervigilance, which amplifies negative cognitions associated with pain and the avoidance of sexual activity. This distress causes hypercontractility of the pelvic floor muscles, reduction in lubrication, and increased pain. Repeated experiences of sexual pain contribute to sexual avoidance (2,8,15). Women with GPPPD often hold catastrophic beliefs about penetration and pain, and avoidance of vaginal penetration becomes their primary coping mechanism (2).

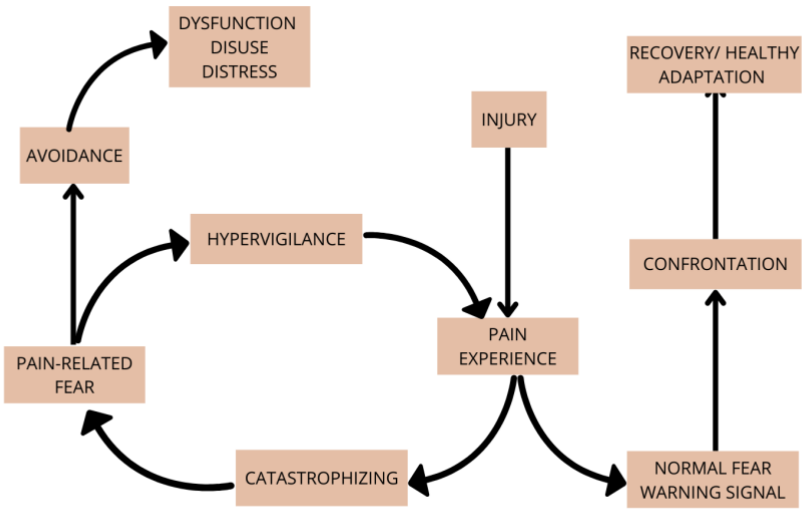


Figure 1. Fear-avoidance model

Another useful theory for understanding the rationale behind this population is the 'pain neuromatrix theory'. The pain neuromatrix is a combination of cortical mechanisms that, when activated, produce pain. This theory suggests that pain is a multifactorial experience induced by different nerve impulses following activation

patterns in the brain cortex (16,17). The cortical areas activated during a painful experience can be referred to as "neurotags". When pain persists, the pain neurotag becomes sensitized and disinhibited. Sensitization of the neurotag refers to an increase in the excitability of the brain cells, making them more easily activated, which means pain is evoked more readily than initially. Disinhibition refers to the decrease in inhibition of other brain cells surrounding the pain neurotag, causing neurotags to lose precision. Pain becomes less localized and more widespread than just the painful region (18). Disinhibition can lead to disruption of movement commands, sensory function, perception of the body part, and other related aspects (18). For example, in persistent pain due to vaginal penetration, the neurotag that activates corresponds to the vaginal entrance. However, when this pain persists over time, it becomes less precise, and perhaps the whole genital area might experience discomfort. Pain can be evoked more easily, not just with vaginal penetration, but also by simply imagining that activity.

These theories indicate that pain does not necessarily originate solely from a painful stimulus; instead, it can arise from the functioning of a neuromatrix. In GPPPD, pain can be experienced in the absence of physical damage and even before vaginal penetration.

Although the etiology of GPPPD can sometimes not be evident, cognitions, emotions and behaviors can maintain the complaints of the condition. It requires a multidisciplinary approach involving medicine, physiotherapy, sex therapy, and psychology.

1.2. Treatment Strategies

Genito-Pelvic Pain/Penetration Disorder is challenging to treat due to its multifactorial etiology. The best approach for treatment should be multidisciplinary and incorporate various evidence-based treatment options.

1.2.1. Medical treatments

The most common medical approaches include vulvar care measures, topical and oral medications, and surgery. Topical and oral medications aim to target peripheral tissues with numbing agents such as lidocaine, cromolyn, and nifedipine. Antidepressant medications are also used to target the central nervous system (2,5); however, research does not strongly support the efficacy of these medical

treatments (19). Surgery management has also shown improvements in pain management but is not recommended as the initial treatment (5). Despite contributing to pain control, surgery may also decrease sensitivity in the vulvar region to pleasure and worsen sexual function and satisfaction (8).

1.2.2. Physiotherapy

Physiotherapy offers a wide range of treatment strategies aimed at managing pain, restoring pelvic floor muscle function, enhancing muscle proprioception awareness, normalizing muscle tone, increasing vaginal elasticity, and promoting muscle relaxation (20). Pain Neuroscience Education, pelvic floor muscle training, gradual exposure dilator use, and electrotherapy are essential components of physiotherapy interventions. Techniques such as myofascial release of pelvic floor muscles and surrounding muscle groups, electromyography, biofeedback, and stretching are also utilized to improve muscle tone, facilitate muscle relaxation, and enhance mobility (5,20). Multimodal physiotherapy has shown effectiveness in improving pain (2).

Pain Neuroscience Education (PNE)

As GPPPD involves a nociplastic pain component, evidence suggests approaching the issue with multidisciplinary education which incorporates psychosocial aspects. Education is crucial for women to develop a deeper understanding of their condition and enhance their knowledge of bodily functions (21). Understanding the condition and learning about anatomy empowers women to better manage their symptoms. Changing attitudes towards pain and reducing catastrophic thoughts have been shown to modify pain intensity in women with chronic pelvic pain conditions. While not extensively studied in GPPPD, addressing these factors has the potential to improve pain intensity, given that hypervigilance and pain catastrophizing are common cognitive issues in GPPPD (13).

Graded Motor Imagery (GMI)

GMI is a commonly used therapy for treating pain conditions such as chronic low back pain, fibromyalgia, phantom limb pain, and Complex Regional Pain Syndrome, targeting nervous system changes and nociplastic pain (22). It addresses cortical alterations in the brain's somatosensory and motor cortices, which are often altered in individuals with persistent pain conditions. GMI consists of three sequential

stages: (1) laterality discrimination (also known as Implicit Motor Imagery), (2) imagined movements (also known as Explicit Motor Imagery), and (3) mirror therapy. A 'fourth stage' involves gradual exposure to functional re-engagement of the affected segment (18,23).

To the best of our knowledge, there are no studies implementing a full GMI program in women with GPPPD. However, evidence supports the use of Implicit Motor Imagery in women with persistent pelvic pain (24), gradual exposure therapies in women with vaginismus (25) and chronic pelvic pain (26) and guided imagery in women with interstitial cystitis (27).

1.2.3. Psychosocial and Mind-Body approaches

For GPPPD, Cognitive-Behavioral Therapy (CBT) focuses on cognitions, emotions, and behaviors that typically amplify pain. It complements physiotherapy treatments and enhances other aspects such as physiological adjustments and relational factors. CBT helps regulate cognitive distortions, emotional changes, and maladaptive behaviors (2,8). Techniques include sex education, distraction techniques using sexual imagery, emotional communication skill training, sexual fantasy training, and cognitive restructuring (28).

Another effective management strategy for persistent conditions is mindfulness, which researchers are beginning to explore in sexual pain disorders, particularly for relaxation techniques (5,25,27).

1.3. Internet-based treatment

The availability of treatment options for women with GPPPD in healthcare settings is limited, and therapists who specialize in this condition are scarce. Consequently, many women with GPPPD do not receive appropriate treatment, leading to increased healthcare costs from frequent visits to health care centers, hospitalizations, and medication use. A potential solution to overcome these economic barriers is to offer evidence-based accessible treatment options, such as internet-based interventions, which have proven effective when treating other sexual dysfunctions (29).

Initial reluctance to seek help among many women is often driven by feelings of shame and guilt, compounded by societal taboos surrounding sexual disorders. Internet-based therapies can significantly enhance treatment accessibility

worldwide by providing convenient access for anyone with internet connectivity at home. This approach promotes anonymity, reduces feelings of fear or shame, and allows women to progress at their own pace while reviewing information as often as needed (30).

1.4. Socio-economic influence

Socio-economic factors are critical health determinants, impacting acute and chronic diseases (31). Research shows a link between lower socio-economic status and increased pain and lower quality of life (32,33). These factors also affect sexual health, as seen in lower sexual satisfaction among Spanish women with lower socio-economic status (34).

1.5. Objectives

1.5.1. General objective

To analyze the effectiveness of conservative treatment options on women diagnosed with Genito-Pelvic Pain/Penetration Disorder.

1.5.2. Specific objectives

Study I

1. To assess the characteristics and quality of the content found in YouTube on dyspareunia.

The hypothesis is that the content on YouTube related to dyspareunia is likely to be scarce and of limited quality.

Study II

1. To assess the levels of correlation between results obtained from a Pain Neuroscience Education program in women diagnosed with GPPPD and their socioeconomic status.

The hypothesis is that socioeconomic status of the participant will significantly influence the effectiveness of a Pain Neuroscience Education program in women diagnosed with GPPPD.

Study III

1. To assess the effectiveness of a Pain Neuroscience Education program on different domains of the Female Sexual Function Index (FSFI) in women diagnosed with GPPPD.

The hypothesis is that Pain Science Education will positively impact sexual function, potentially improving scores in at least some domains of the FSFI.

Study IV

1. To translate and assess the psychometric properties of the Vaginal Penetration Cognition Questionnaire in Spanish within a population of women diagnosed with GPPPD.

The hypothesis of this study is that VPCQ in Spanish will demonstrate reliability and validity in assessing vaginal penetration cognitions among women with GPPPD.

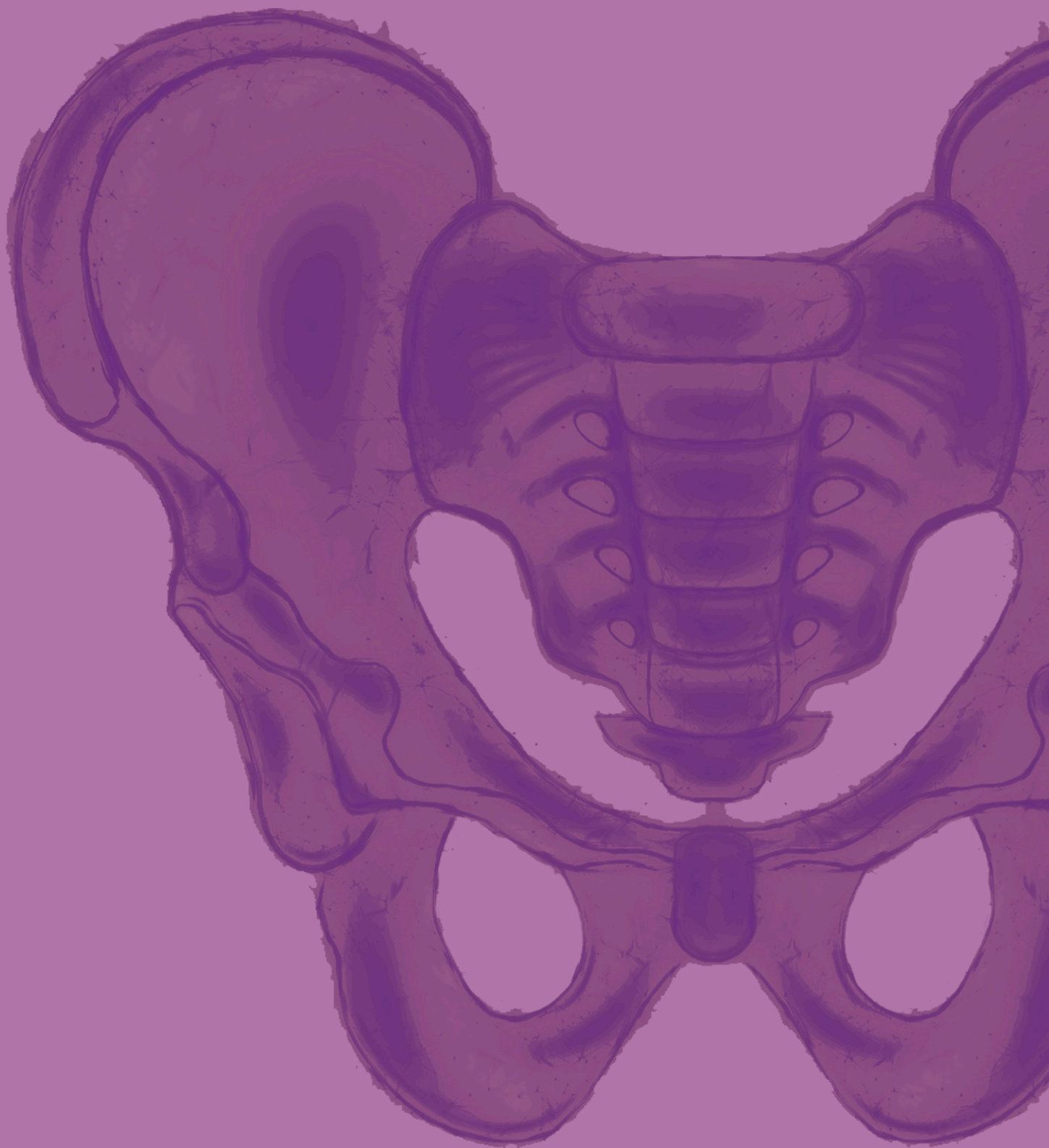
Study V

1. To assess the effects of a Graded Motor Imagery (GMI) program in women diagnosed with GPPPD regarding pain intensity and sexual function.

The hypothesis is that a GMI program will improve pain intensity and sexual function in women with GPPPD.

Chapter 2.

MATERIALS & METHOD



2. Materials and Method

All required studies followed the Code of Ethics of the World Medical Association ethical principles (Declaration of Helsinki) and were approved by the Ethics Committee of Research in Humans of the University of Valencia. The following table details the approval of different committees on the required studies.

Table 1. Studies and their corresponding Ethical Committee and clinical trial registration number

Study	Ethics Committee	Clinical Trials
I. Educational videos about dyspareunia and the assessment of their quality and reliability: An observational study.	Not applicable.	Not applicable.
II. Association Levels Between Results from a Therapeutic Educational Program on Women Suffering from Genito-pelvic Pain Penetration Disorder and Their Socioeconomic Status.	- Ethics Committee of Research in Humans of University of Valencia (UV-INV_ETICA-1741806)	NCT05114473
III. Assessing Sexual Functioning with the Female Sexual Function Index in Women Suffering from Genito-Pelvic Pain Penetration Disorder Undergoing a Therapeutic Educational Program.	- Ethics Committee of Research in Humans of University of Valencia (UV-INV_ETICA-1741806)	NCT05114473
IV. Psychometric Properties of the Translated Spanish Version of the Vaginal Penetration Cognition Questionnaire: A Preliminary Work for Validation.	- Ethics Committee of Research in Humans of University of Valencia (UV-INV_ETICA-2557852)	Not applicable.
V. Online Graded Motor Imagery is effective in women suffering Genito-Pelvic Pain Penetration Disorder. A randomized controlled trial.	- Ethics committee of Research in Humans of University of Valencia (UV-INV_ETICA-2678233)	NCT05637502

2.1. Study I: Educational videos about dyspareunia and the assessment of their quality and reliability. An observational study.

2.1.1. Design

This observational study was conducted in February 2021 using the YouTube platform. On February 18th, a search was performed using the term "dyspareunia." This term was chosen over alternatives like "painful sex" or "genito-pelvic pain/penetration disorder" to avoid potentially irrelevant or unrelated content. A straightforward search strategy without filters was employed, resulting in the selection of the first 150 videos generated by the search. Each video's Uniform Resource Locator (URL) was used for identification and screening. Videos were excluded if they: (1) were in a language other than English, (2) had less than 1000 views, (3) were duplicates, (4) lacked medical relevance, or (5) required age verification for viewing. Following the application of eligibility criteria, videos were screened and independently reviewed by two researchers who analyzed and assessed their content.

2.1.2. Outcomes

Videos were categorized based on their source: academic, health organization, media, or individual. The country of origin for each video was also identified. Descriptive statistics included view count, likes, dislikes, days online, authors, and duration of the videos. The Video Power Index (VPI) and View Ratio were used to determine the popularity index of the videos (35).

To assess the quality of the video as an educational source the DISCERN instrument, the Global Quality Scale (GQS) and the Quality Evaluation Scoring Tool (QUEST) were used.

The DISCERN questionnaire comprises 16 questions (36). Questions 1-8 contemplate reliability; 9-15 information quality and question 16 contemplates the overall quality. Each question is rated in a 1-5 Likert-scale (1=very poor, 5= very high quality). There is a total possible score of 80 points, with higher results meaning higher quality.

The GQS is used to assess the quality of online content (37). It consists of a scale ranging from 1 to 5, being 1 the lowest, and each point has a brief description of quality content.

The QUEST tool evaluates health information quality across six domains: authorship, attribution, conflict of interests, currency, complementarity, and tone (38). A total of 28 points can be assigned, being 28 the highest quality.

2.1.3. Statistical Analysis

Descriptive statistics including mean, minimum, and maximum values, along with standard deviation (SD), were calculated for each video based on the quality scales. Additionally, 95% confidence intervals were established, with statistical significance set at $p < 0.05$.

The kappa coefficient (k) was used to determine the interrater agreement. Values range from -1 to +1, where +1 indicates perfect agreement, 0 indicates agreement expected by chance, and -1 indicates complete disagreement. A kappa value greater than 0.7 suggests substantial agreement, while less than 0.5 indicates poor agreement.

To determine how consistent repeated measures could be, the Intraclass Correlation Coefficient (ICC) was used. ICC values range from 0 to 1, where 1 indicates perfect reliability, and 0 indicates no reliability. A higher ICC value indicates greater reliability and consistency in measurements.

Pearson's correlation index was also applied. It measures the strength and direction of the linear relationship between two variables. Values range from -1 to +1, with +1 indicating a perfect positive linear relationship, 0 indicating no linear relationship, and -1 indicating a perfect negative linear relationship.

2.2. Study II: Association Levels Between Results from a Therapeutic Educational Program on Women Suffering from Genito-Pelvic Pain Penetration Disorder and their Socioeconomic Status.

2.2.1. Design

This study addresses a correlation analysis between the participant's socioeconomic status and results of a Pain Neuroscience Education program in women diagnosed with GPPPD.

An intervention was conducted implementing a Pain Neuroscience Education program, which was delivered either in person or online. Participants were recruited from December 2021 to February 2022 from two hospital databases in Spain, via social media channels, and through posters displayed in physiotherapy clinics (Figure 2). Eligibility was determined through an online screening form. Inclusion criteria were: (1) adult women aged >18 years, (2) experiencing pain during, after, or in attempts of intercourse for more than 6 months, and (3) absence of any medical condition that could explain the pain.

Figure 2. Poster for participant recruitment

2.2.2. Intervention

Pain Neuroscience Education was delivered through two parallel groups: one through in-person workshops and the other through online workshops, while an additional group, which served as control, initially received no intervention.

The in-person workshops were conducted weekly at the Faculty of Physiotherapy of the University of Valencia by members of the research team (Figure 3), spanning 4 weeks. Each workshop lasted 45 to 60 minutes. Participants received an email or text message the day before each workshop to confirm their attendance, and attendance was monitored weekly by the researchers.

Figure 3. Image of the in-person workshops

The online group followed an identical program delivered via YouTube (Figure 4). Participants received weekly video links via email, allowing them to watch at their convenience and offering autonomy over their viewing schedule. Each session lasted approximately 30 to 40 minutes, featuring the same resources. After viewing the videos, participants could engage by commenting and posing questions that were answered as fast as possible by any researcher in the team.

Figure 4. Screenshot of the online educational program

The control group did not receive any intervention as part of the study; however, upon completion of the study, they were provided access to the online workshops and all accompanying materials.

The program was developed by three researchers, all physiotherapists specializing in pelvic health. It aimed to educate participants on anatomy and Pain Science Education, body awareness therapy, and psychosexual advice to alleviate pain. Each workshop included theoretical content and home-based activities. Anatomy was taught using anatomical images of the genitals and a pelvic model. Pain Neuroscience Education utilized interactive stories to illustrate the mechanisms of persistent pain during sexual intercourse. Participants received advice on pain management through graded exposure. Sexuality topics included education on sexual function (physiology of desire, arousal, and orgasm), followed by body awareness therapy (encouraging genital self-exploration, guided masturbation, and addressing negative thoughts). Desensitization techniques using vibrators involved gradual exposure, beginning with placement outside the genital area (e.g., on the hips) and gradually approaching the painful area.

After the theoretical sessions, participants were given home-based activities aimed at enhancing body awareness, particularly of the genital area, which many women may not be familiar with. One activity involved drawing their vulva without initially using a mirror, followed by a second attempt after observing their reflection. This exercise aimed to increase awareness of genital anatomy. Another activity utilized a body map for participants to mark areas where they felt arousal by touch, areas they preferred not to be touched, and areas deemed acceptable for touch. This exercise aimed to clarify personal preferences and guide partners in avoiding painful areas during intimacy. Additional activities included guided masturbation via audio or video provided by the research team, along with instructions on gradual exposure.

This is the guideline used for every workshop:

- Workshop 1:
    - Introduction to pelvic floor anatomy and function, practical exercises for body awareness during rest and movement. Explanation of pain, its role in survival, and the consequences of excessive pain.
- Workshop 2:
    - Further exploration of vaginal and clitoral anatomy and their connection to pelvic floor muscles during sexual arousal. Introduction to sexuality. Emphasis on pain as a protective mechanism and the potential for overprotection leading to pain in perceived 'dangerous' situations.
- Workshop 3:
    - Exploration of pleasurable aspects of sexuality, explanation of sexual intercourse dynamics. Discussion on pain during intercourse and reflection on personal experiences or beliefs contributing to pain.
- Workshop 4:
    - In-depth exploration of personal sexuality, provision of tools to challenge negative beliefs. Introduction to gradual exposure as a tool for managing persistent pain conditions, applied to sexuality.

Participants were stratified by location due to their diverse geographic locations. They were categorized into two groups: those residing near the in-person workshop location and those who did not. Those living nearby were randomly assigned to either the in-person workshop or control group. Participants residing abroad were randomized into the online workshop or control group. Randomization used a 2:1 allocation ratio with the opaque envelope method. Workshop facilitators and participants were not blinded, but all statistical analyses were conducted by a blinded researcher.

2.2.3. Outcomes

Baseline and three-week post-intervention outcomes were evaluated via email or phone calls. The primary outcome was pain intensity, measured using the Visual Analogue Scale (VAS), a 100-mm line anchored with verbal descriptors ranging from "no pain" to "worst possible pain" where participants marked their subjective perception of pain intensity. Secondary outcomes included pain catastrophizing assessed with the Pain Catastrophizing Scale (PCS), a 13-item questionnaire scored from 0 to 52, with higher scores indicating greater catastrophizing tendencies (39). Pain attitudes were measured using the brief version of the Survey of Pain Attitudes (SOPA-B), a 30-item survey scored from 0 to 120, with lower scores indicating poorer outcomes (40). Sexual function was assessed with the Female Sexual Function Index (FSFI), which evaluates desire, arousal, lubrication, orgasm, satisfaction, and pain on a scale of 2 to 36 points; lower scores indicate poorer sexual function (41).

Socioeconomic status (SES) was evaluated using a tailored questionnaire (43,44). This is an adaptive resource that establishes a level or category according to simple questions involving a wide variety of domains that could include income, occupation, or educational level. In this study SES was assessed with several questions that classified participants according to their educational level, household monthly income, and job rank. Participants' age was also registered.

Educational level was categorized according to the International Standard Classification of Education (ISCED) (45) in 9 different levels (from 0=pre scholar education level to 9=doctoral education level). Household monthly income was established according to the Spanish National Institute of Statistics (INE) (46) in 11

different levels (from 0 to more than 5.000 euro per month). Job rank was established according to the Spanish Ministry of Labor (47) through its latest collective occupational agreement in 6 different levels (from level 1 being a job that requires no degree and level 6 a job that requires a college degree).

2.2.4. Statistical Analysis

Sample size was determined using G*Power software (42) based on a previous study assessing pain intensity via VAS in a similar population (20). The study required a minimum of 69 participants overall, with 23 participants per group, to achieve 80% statistical power at an α-error of 0.05.

Statistical analyses were conducted using SPSS version 23.0 for MacOS. To assess changes over time, a two-way mixed ANOVA was employed, with results reported as mean difference (MD). Statistical significance was set at $p < 0.05$. Normality of data distribution was confirmed using the Kolmogorov-Smirnov test. Between-group differences were analyzed using the Bonferroni post-hoc test.

Pearson's correlation coefficient was used to assess the relationship between results obtained from the intervention and participants' age. Pearson's correlation measures the strength and direction of a linear relationship between two continuous variables, ranging from -1 (perfect negative linear relationship) to +1 (perfect positive linear relationship), with 0 indicating no linear relationship.

For the remaining SES outcomes (educational level, monthly income, and job rank), due to their nature, associations were established using Spearman's rho, a non-parametric test. Spearman's rho evaluates the strength and direction of a monotonic relationship between variables, also ranging from -1 (perfect negative monotonic relationship) to +1 (perfect positive monotonic relationship), with 0 indicating no monotonic relationship.

2.3. Study III: Assessing Sexual Functioning with the Female Sexual Function Index in Women Suffering from Genito-Pelvic Pain Penetration Disorder Undergoing a Therapeutic Educational Program.

2.3.1. Design

This study evaluated the impact of a Pain Neuroscience Education program on sexual functioning, measured by the Female Sexual Function Index, in women diagnosed with Genito-Pelvic Pain Penetration Disorder.

2.3.2. Outcomes

Sexual functioning was assessed using the Spanish version of the Female Sexual Function Index (FSFI), a validated questionnaire widely used in sexual dysfunction research (48). The FSFI contains six domains: desire, arousal, lubrication, orgasm, satisfaction, and pain. It consists of 19 items grouped into these domains, with each item offering 5 to 6 possible responses. Total scores range from 2 to 36 points, where higher scores indicate better sexual functioning. Calculation of domain scores involves summing relevant item scores and multiplying by a domain-specific factor, with the overall score being the sum of all domain scores (41). Table 2 shows a summary on how to calculate the scores in the FSFI.

Table 2. Summary of how to calculate the Female Sexual Function Index score

Domain	Items	Range of answers	Correcting factor	Minimum score	Maximum score
Desire	1-2	1-5	0.6	2	6
Arousal	3-6	0-5	0.3	0	6
Lubrication	7-10	0-5	0.3	0	6
Orgasm	11-13	0-5	0.4	0	6
Satisfaction	14-16	0-5 or 1-5	0.4	0	6
Pain	17-19	0-5	0.4	0	6
Overall				2	36

2.3.3. Statistical Analysis

Statistical analyses were conducted using SPSS version 23.0 for MacOS. Normality of data distribution was confirmed using the Kolmogorov-Smirnov test.

This is an ancillary analysis conducted from the initial intervention described in Study II. The change over time in each of the items contained within the FSFI was assessed through multiple t-tests. Mean differences (MD) and standard deviations were then established for each of the domains of the questionnaire. Significant changes were established at $p < 0.05$.

2.4. Study IV: Psychometric Properties of the Translated Spanish Version of the Vaginal Penetration Cognition Questionnaire: A Preliminary Work for Validation.

2.4.1. Design

This cross-sectional study was conducted from November 2022 to January 2023. Potential participants were recruited by the research team through their social media accounts and communication channels of the Faculty of Physiotherapy at the University of Valencia and the Chartered Society of Physiotherapists of Valencia, using online surveys. A convenience sample of women diagnosed with GPPPD was obtained. Inclusion criteria were: (1) adult women over 18 years old, (2) experiencing pain in the genital area before, during, or after vaginal intercourse for at least three months, and (3) the ability to read and write in Spanish. Exclusion criteria included a medical history of other pathophysiological conditions such as infections, gynecological cancer, vulvar dermatological conditions, painful bladder syndrome, pregnancy, or pelvic surgery, as well as an inability to understand Spanish.

2.4.2. Procedures

Before initiating the translation process, a team member contacted Dr. Moniek M. ter Kuile, the developer of the original English version, who granted permission for the translation and adaptation of the Vaginal Penetration Cognition Questionnaire (VPCQ) into Spanish. To ensure the questionnaire's suitability for use in a different language, a thorough translation process was undertaken, following established guidelines (49). The translation process was conducted following these steps:

1. A member of the research team (BPD), a native Spanish speaker fluent in English, translated each item from the original version into Spanish.
2. This initial translation was reviewed by an independent team member (ALB), also a native Spanish speaker fluent in English. Any discrepancies in the translation process between the two authors were resolved through consensus.

3. Finally, another research team member (JC), a native Spanish speaker fluent in English, back-translated the Spanish version into English. The final version of the translation was approved by the research team through consensus.

Participants were contacted online through a survey created using Google Forms. The survey consisted of two sections: the first section gathered demographic information, and the second section focused on the Vaginal Penetration Cognition Questionnaire (VPCQ) in Spanish. Data collection was supervised by a member of the research team and recorded in a dedicated spreadsheet. To evaluate test-retest reliability, a subgroup of 89 participants who initially completed the survey were asked to complete it again one week later.

2.4.3. Outcomes

Baseline demographic measures were recorded, including age, marital status, educational level, and pain duration.

The Vaginal Penetration Cognition Questionnaire assesses thoughts and emotions related to vaginal penetration in women experiencing vaginismus and dyspareunia. It comprises a 22-item questionnaire categorized into five domains: (1) control cognitions, (2) catastrophic and pain cognitions, (3) self-image cognition, (4) positive cognitions, and (5) genital incompatibility cognitions (50). Subscale scores range from 0 to 30. A higher score in the "positive cognitions" subscale indicates better sexual functioning, while higher scores in the other subscales suggest greater sexual impairment.

2.4.4. Statistical Analysis

The sample size for this study was determined following established guidelines for survey tool validation (50) which recommend a minimum of 10 participants per item in the questionnaire. Moreover, guidance from COSMIN (Consensus-based Standards for the selection of health Measurement Instruments) (51) was also followed, which suggests a sample size of at least seven times the number of items for structural validity analysis, totaling more than 100 participants. Therefore, for the 22-item Vaginal Penetration Cognition Questionnaire (VPCQ), a sample of 220 participants was deemed necessary.

Statistical analyses were conducted using SPSS Statistics software version 22.0 for MacOS. Baseline demographic data were described with means and standard deviations for continuous variables, and counts and percentages for categorical variables. Normality of data distribution was assessed using the Kolmogorov-Smirnov test. Missing values were handled by imputing the participants' average response.

Validity of the VPCQ was evaluated through exploratory factor analysis (EFA) to determine its factor structure, and by assessing convergent and discriminant validity (52). EFA involved principal component analysis with Varimax rotation, and the number of factors was determined using the Scree-test criteria (53). Sampling adequacy was confirmed with the Kaiser-Meyer-Olkin measure (>0.5) (54), and the significance of the factor structure was assessed with the Bartlett test of sphericity (55).

Convergent validity was assessed using the average variance extracted (AVE) and maximum shared variance (MSV) criteria proposed by Fornell and Larcker (56). AVE values between 0.5 and 0.7 indicate acceptable convergent validity, while values >0.7 indicate good convergent validity. Discriminant validity was confirmed if the MSV values were lower than the AVE values.

Test-retest reliability, which evaluates the stability of measurements over time, was assessed using the Intraclass Correlation Coefficient (ICC) with a two-way random effects model (model-alpha). ICC values range from 0 to 1, with higher values indicating greater reliability: 0-0.4 (low), 0.4-0.6 (moderate), 0.6-0.8 (good), and >0.8 (excellent) correlation levels (57). Additionally, a Bland-Altman graphical representation was conducted by plotting the mean differences of both measurements with their corresponding limits of average difference ± standard deviation of the difference (58).

Measurement error was quantified using the standard error of measurement (SEM) and the minimal detectable change (MDC). SEM was calculated as SD x $\sqrt{}$(1 - R), where SD is the standard deviation and R is the reliability coefficient of the instrument (59). MDC was computed using the formula 1.96 x $\sqrt{}$(2 x SEM).

Internal consistency, which measures the coherence among items within a measurement tool, was assessed using Cronbach's α coefficient. Cronbach's α values range from 0 to 1, with values >0.7 indicating acceptable internal consistency, >0.8 indicating good consistency, and >0.9 indicating excellent consistency (60).

2.5. Study V: Online Graded Motor Imagery is effective in women diagnosed with Genito-Pelvic Pain Penetration Disorder. A randomized controlled trial.

2.5.1. Design

A randomized controlled trial was conducted to assess the efficacy of a tailored Graded Motor Imagery (GMI) program in women diagnosed with Genito-Pelvic Pain/Penetration Disorder. Participants were recruited from April to May of 2023 through consultations at physiotherapy clinics around Valencia, an infographic shared on social media accounts (Figure 5), email, and in collaboration with a Spanish association for patients with persistent pelvic pain (*Asociación del Dolor Pélvico Crónico*, ADOPEC).

Figure 5. Infographic delivered for participant recruitment

Potential participants were asked to fill out an online survey with their personal information and a questionnaire used for discriminating persistent pelvic pain, previously validated in Spanish (CPPQ-Mohedo) (61) to assess eligibility. Inclusion criteria were: (1) adult women (>18 years old), (2) experiencing pain with vaginal penetration during sexual intercourse for more than 6 months, and (3) a score of more than 6 points on the CPPQ-Mohedo questionnaire. Participants were excluded if they had any disorder or medical condition that explained the presence of pain, such as infection, a recent scar, or a vulvar dermatological condition.

If participants met the inclusion criteria, they were sent an online form requesting baseline characteristics and outcome measurements, along with an explanatory video or written document containing the study procedure and all relevant information. Randomization was performed using the sealed-opaque envelope system with a 1:1 ratio, assigning participants to either the GMI group or the control group. Both participants and the researchers responsible for assessment and statistical analysis were blinded to group assignments.

2.5.2. Intervention

Firstly, all participants were asked to fill out an online form with all the outcome measurements. Participants allocated to the intervention group underwent a tailored GMI program. They were sent an email with a written document and a video explaining all the necessary information for the program, detailing each phase individually.

The program followed protocols from similar studies utilizing GMI (26,62–64). The total duration was 6 weeks, consisting of 3 phases. Each phase lasted for 2 weeks, and every 2-3 days participants received an email with the exercise they needed to complete for that day.

The first phase of the GMI program is Implicit Motor Imagery, which involves subconscious activities such as a left/right laterality discrimination judgment exercise (18). For this study, the Implicit Motor Imagery exercise consisted of viewing pain-related images through a web version of an app (App-Mohedo (24)). Prior to the start, participants were sent a video explaining how to access the app and perform the exercise correctly. Photographs of the abdominoperineal area were shown, and participants had to indicate whether the photograph represented a left or right side perspective by pressing a button on their mobile phones. Each participant accessed the app using a unique code provided by the team, allowing their speed and accuracy results to be recorded. This phase lasted for 2 weeks, with exercise reminders sent to participants every 2-3 days via email. After two weeks, participants were asked to fill out an online form with their VAS and FSFI-6 scores.

The second phase is Explicit Motor Imagery, which involves viewing pain-related images and imagining them mentally without any physical movement (18). In this study, this phase was developed through six audio recordings that participants

listened to while mentally visualizing various exercises. Participants were instructed to find a quiet place and concentrate while listening to the audios. The recordings represented a gradual progression of potentially painful activities related to their genital area, based on the Sensate Focus program developed by Masters and Johnson in 1970 (65). The audios were created by a team member, a physiotherapist specializing in pelvic floor disorders, and reviewed by a sexologist. Each recording had an average duration of 30 minutes. The audios were available in mp3 format, YouTube videos, or through iVoox, a platform where audios can be downloaded. Every 2-3 days during the two-week period, an email was sent with a link to the corresponding audio. At the end of the two weeks, another email was sent with an online form for participants to fill out their VAS and FSFI-6 scores.

When participants completed the measurements, the third and final phase was initiated. This phase consisted of gradual exposure therapy. Participants received a document and a brief explanatory video detailing the activity they had to perform every 2 days. Gradual exposure began with self-exploration and progressed to sexual intercourse, based on the Sensate Focus program by Masters and Johnson (66). After 2 weeks, the final online form was sent to assess the outcomes.

In-between phases, emails were sent to ensure adherence and address any doubts. Participants were advised that if they experienced pain while performing an exercise, they should either move to a lower level or continue with the same exercise until the pain subsided.

Participants allocated to the control group did not receive any intervention, but completed outcome assessments every two weeks. After the program concluded, participants in this group received all the exercises from the three phases, along with the necessary information.

2.5.3. Outcomes

Two blinded research team members assessed baseline, in-between phase, and post-intervention outcomes. Baseline demographic characteristics collected included age, educational level, marital status, and current treatments. Educational level was established according to the International Standard Classification of Education (ISCED) (45), where Level 0= Early childhood education, Level 1= Primary education, Level 2= Lower secondary education, Level 3= Upper secondary

education, Level 4= Post-secondary non-tertiary education, Level 5= Short-cycle tertiary education, Level 6= Bachelor's or equivalent level, Level 7= Master's or equivalent level, and Level 8= Doctoral or equivalent level.

The validated Spanish version (67) of the Movement Imagery Questionnaire-Revised (MIQ-R) was used to assess participants' ability to mentally visualize and feel movements. Participants were asked to imagine eight different movements and rate, on a scale from 1 to 7, how easy it was to imagine each movement (1 = very difficult to see/feel and 7 = very easy to see/feel). Scores range from 8 to 56, with higher scores indicating better movement imagery ability.

Participants' beliefs and thoughts about vaginal penetration were assessed using the validated Spanish version of the Vaginal Penetration Cognition Questionnaire (VPCQ) (68). The VPCQ consists of a 22-item Likert scale ranging from 0 (not applicable at all) to 6 (very strongly applicable), evaluating four domains related to vaginal penetration: control cognitions, catastrophic and pain thoughts, self-image beliefs, and positive cognitions. Higher scores in all domains imply worse cognitions about vaginal penetration, except for the 'control cognitions' domain, where higher scores indicate higher levels of perceived penetration control.

Pain intensity was assessed through the Visual Analogue Scale (VAS). This outcome was measured before and after the intervention, and in-between phases. Scores are based on self-reported measures registered using a mark placed on a 100mm line that represents a continuum between the two ends of the scale ("no pain" and "worst possible pain").

To assess sexual function, the short version of the Female Sexual Function Index was used (FSFI-6). In this shortened version, 6 of the original 19 items are assessed, involving one item per domain. The Spanish version of this validated questionnaire was used (69). Scores can range from 2-30, higher scores indicating better sexual function.

2.5.4. Statistical Analysis

Statistical analyses were conducted using SPSS version 28.0 for MacOS (SPSS Inc., Chicago, IL). Descriptive statistics included demographic characteristics, with means and standard deviations used for quantitative outcomes, and frequencies for

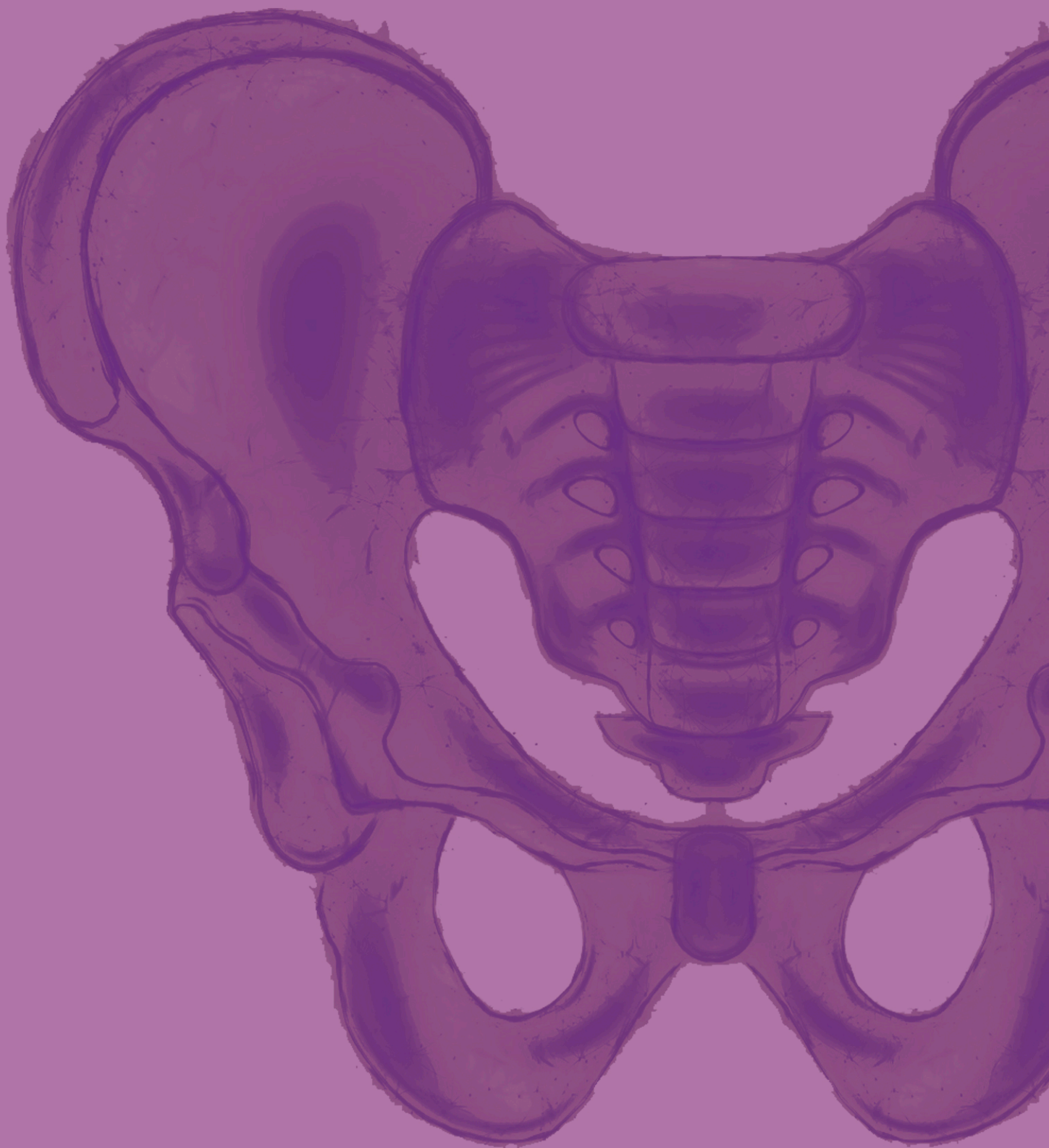
qualitative outcomes. Normality of data distribution was assessed using the Kolmogorov-Smirnov test.

Sample size calculations determined that each group should include a minimum of 40 participants, providing 80% power to detect a clinically meaningful reduction of 1.4 points in pain intensity (VAS) with a standard deviation of 1.3 points, based on previous research, at an α-error level of 0.05.

Pain intensity and sexual function were analyzed using mixed-model two-way repeated measures ANOVA to assess within-subject (time: pre-post) and between-subject (group: GMI or control) differences. Post-hoc comparisons were conducted using the Bonferroni test to further explore group differences.

Subsequently, Pearson's correlation coefficient was used to examine associations between participants' movement imagery ability, beliefs, and thoughts about vaginal penetration, leveraging outcomes from the ANOVA analysis.

Chapter 3.
RESULTS



3. Results

3.1. Study I: Educational videos about dyspareunia and the assessment of their quality and reliability. An observational study.

3.1.1. Video Characteristics

In terms of production sources, the analysis revealed that 37.5% of the videos were created by Health Organizations, 32.5% by individuals, 15% by academic institutions, and 15% by media (Figure 6). Regarding their country of origin, 67.5% of the videos were produced in the USA, 8% in Australia, 5% each in the UK, Canada, India, Nigeria, 3% in Bosnia, and 3% in Switzerland (Figure 7).

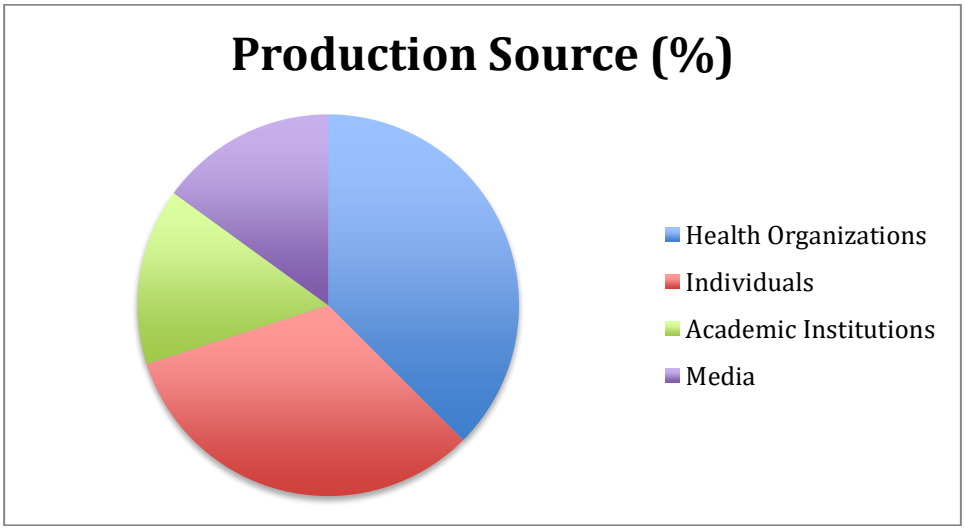


Figure 6. Production source of the videos

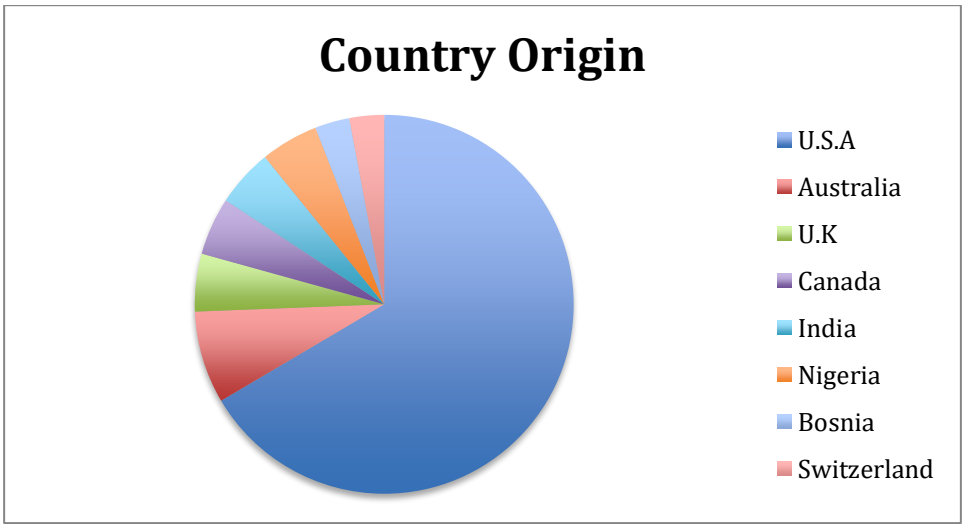


Figure 7. Country of production of the videos

3.1.2. Descriptive Statistics

Table 3 presents descriptive statistics of the videos. The mean number of views was 35,513.1 (SD 71,443.9), with an average video length of 5 minutes and 39 seconds (SD 4 minutes and 38 seconds), and a mean online duration of 1,396.3 days (SD 706). The average view ratio was 29.8 days (SD 68.1), with an average of 333 Likes (SD 1,000.6) and 13 Dislikes (SD 25.3). The mean VPI Index was 92.1% (SD 16.4%). Inter-rater agreement for the assessments was high (κ=0.820).

Table 3. Descriptive Statistics of the videos

	Min	Max	Mean ±SD
View Count	1.116	307.460	355,131 ± 714,439
Duration (mins)	00:48	22:28	05:39 ± 04:38
Days online	276	2717	13,963 ± 706
View Ratio (views/day)	0.5	285.6	29.8 ± 68.1
Likes	0	6077	333 ± 1,000.6
Dislikes	0	113	13 ±25.3
VPI Index (%)	0	100	92.1 ± 16.4

Max: Maximum; Min: Minimum; SD: Standard Deviation; VPI: Video Power Index

Table 4 presents descriptive statistics of the quality scales. Observer 1 rated the mean DISCERN instrument score at 40.9 points (SD 9.9), while Observer 2 rated it at 39.3 points (SD 8.5). The mean GQS score was 3.1 points (SD 0.9) for Observer 1 and 3.0 points (SD 0.8) for Observer 2. For the QUEST tool, Observer 1 gave a mean score of 13.3 points (SD 4.1), with Observer 2 rating it at 13.1 points (SD 4.2).

Table 4. Descriptive Statistics of the quality scales

	Min		Max		Mean ± SD	
	Observer 1	Observer 2	Observer 1	Observer 2	Observer 1	Observer 2
DISCERN	25	25	62	61	40.9 ± 9.9	39.3 ± 8.5
GQS	1	1	5	5	3.1 ± 0.9	3.0 ± 0.8
QUEST	5	5	24	24	13.3 ± 4.1	13.1 ± 4.2

GQS: Global Quality Scale; Max: Maximum; Min: Minimum; SD: Standard Deviation; QUEST: Quality Evaluation Scoring Tool

Table 5 displays the reliability values. The DISCERN instrument presents correlation values of 0.837 for ICC and 0.846 for Pearson's index. The GQS score showed correlation values of 0.839 for ICC and 0.841 for Pearson's index. The QUEST tool demonstrated values of 0.982 for both ICC and Pearson's index. Mean scores from both observers were used in order to calculate values for the DISCERN instrument, GQS and GUEST tool.

Table 5. Interrater reliability values

	Intraclass correlation coefficient	Pearson's correlation index	p-values
DISCERN	0.837	0.846	<0.001
GQS	0.839	0.841	<0.001
QUEST	0.982	0.982	<0.001

GQS: Global Quality Scale; QUEST: Quality Evaluation Scoring Tool

3.1.3. Outcomes

According to the DISCERN scores, 3% of the videos were of very poor quality, 25% were poor quality, 50% scored as being of average quality, 20% scored high quality, and 2% were found to be very high quality. Similar scores were observed using the GQS assessment.

Regarding the relationship between the quality of the videos, according to the DISCERN instrument, and their source of production, it was found out that videos made by Academic institutions scored higher (45.1, SD 12.2), followed by individuals (41.7, SD8.9), Health Organizations (38.9, SD 8.2) and Media (41.7, SD 8.9). According to GQS, higher quality videos were produced by Academic Institutions (3.2, SD 1.2), followed by Health Organizations (3.2, SD 0.8), Individuals (3, SD 0.9) and Media (2.5, SD 0.8). Finally, the higher QUEST tool results were videos produced by Academic Institutions (15.6, SD 5.1), followed by Health Organizations (14.0, SD 3.7), Individuals (12.7, SD 3.2) and Media (9.4, SD 4.6).

The source of production with higher View Ratio was Media (104.6, SD 156.5), followed by Health Organizations (19.2, SD 27.3), Individuals (18.3, SD 24.3) and Academic Institutions (6.5, SD 12.3). Results are summarized on Table 6.

Table 6. Information sources and video quality

	DISCERN (mean ± SD)	GQS (mean ± SD)	QUEST (mean ± SD)	View ratio (mean ± SD)
Academic Institution	45.1 ± 12.2	3.1 ± 1.2	15.6 ± 5.1	6.5 ± 12.3
Health Organization	38.9 ± 8.2	3.2 ± 0.8	14.0 ± 3.7	19.2 ± 27.3
Media	34.7 ± 7.5	2.5 ± 0.8	9.7 ± 4.6	104.6 ± 156.5
Individual	41.7 ± 8.9	3.0 ± 0.9	12.7 ± 3.2	18.3 ± 24.3

GQS: Global Quality Scale; SD: Standard Deviation; QUEST: Quality Evaluation Scoring Tool

Lastly, Table 7 presents the relationship between video quality assessed by DISCERN, GQS, and QUEST scores, and their country of origin. According to the DISCERN instrument, videos produced in Switzerland demonstrated the highest quality (48.0, SD 0.0), followed by those from the UK (46.5, SD 6.4), Nigeria (46.3, SD 8.1), Australia (42.3, SD 1.5), Bosnia (42.0, SD 0.0), Canada (41.0, SD 11.3), USA (38.3, SD 10.1), and India (36.0, SD 2.8).

GQS scores were of higher quality when produced in Switzerland (42.0, SD 0.0), followed by videos from Nigeria (3.8, SD 0.4), Australia (3.3, SD 0.6), a video produced in Bosnia (3.0, SD 0.0), videos from the U.S.A (3.0, SD 1.0), Canada (3.0, SD 1.4), the UK and India (2.5, SD 0.7 for both).

Furthermore, the QUEST tool showed better results in videos from the UK (17.0, SD 0.0), followed by Switzerland (15.0, SD 0.0), videos from Canada (14.5, SD 2.1), the video from Bosnia (14.0, SD 0.0), videos from the USA (13.3, SD 4.6), Australia (13.0, SD 3.0), Nigeria (10.8, SD 1.1) and India (8.5, SD 2.1).

Videos with higher View Ratios were the ones produced in Nigeria (45.0, SD 47.9), followed by the ones produced in Australia (36.1, SD 48.6), USA (33.9, SD 80.6), Switzerland (29.6, SD 0.0), India (16.3, SD 20.8), Canada (7.0, SD 2.9), Bosnia (2.4, SD 0.0) and videos produced in the UK (0.9, SD 0.6).

Table 7. Country of origin and video quality

	DISCERN (mean ± SD)	GQS (mean ± SD)	QUEST (mean ± SD)	View ratio (mean ± SD)
U.S.A	38.8 ± 10.1	3.0 ± 1.0	13.3 ± 4.6	33.9 ± 80.6
Australia	42.3 ± 1.5	3.3 ± 0.6	13.0 ± 3.0	36.1 ± 48.6
U.K	46.5 ± 6.4	2.5 ± 0.7	17.0 ± 0.0	0.9 ± 0.6
Canada	41.0 ± 11.3	3.0 ± 1.4	14.5 ± 2.1	7.0 ± 2.9
Bosnia	42.0 ± 0.0	3.0 ± 0.0	14.0 ± 0.0	2.4 ± 0.0
Switzerland	48.0 ± 0.0	4.0 ± 0.0	15.0 ± 0.0	29.6 ± 0.0
India	36.0 ± 2.8	2.5 ± 0.7	8.5 ± 2.1	16.3 ± 20.8
Nigeria	46.3 ± 8.1	3.8 ± 0.4	10.8 ± 1.1	45.0 ± 47.9

GQS: Global Quality Scale; SD: Standard Deviation; QUEST: Quality Evaluation Scoring Tool

3.2. Study II: Association Levels Between Results from a Therapeutic Educational Program on Women Suffering from Genito-Pelvic Pain Penetration Disorder and Their Socioeconomic Status.

3.2.1. Participants baseline demographic characteristics

A total of 69 patients were recruited and randomly allocated into three groups: the in-person group (n=18), the online group (n=29), and the control group (n=22) between December 2021 and January 2022.

Initially, 76 women were screened, of whom 69 met the inclusion criteria and were enrolled in the study. Four participants were lost to follow-up as they didn't answer post-intervention questionnaires; thus, the final analysis included data from the 65 women who were assessed one month after the intervention. A summary of participants' baseline characteristics is provided in Table 8, where we can see the mean age of all participants was 32.8 years (SD 9.5), and the recruitment sources were predominantly social media (91%) and hospital databases (9%).

Table 8. Participant baseline demographic characteristics

	In-person group	Online group	Control group	Total
Age (SD)	34.5 (13.2)	31.6 (6.9)	33.0 (9.1)	32.8 (9.5)
Origin				
Hospital La Plana	0	3	1	4
Hospital Sagunto	2	0	0	2
Social media	16	26	21	63

SD: Standard Deviation

3.2.2. Participants' socioeconomic status

Participants' socioeconomic status levels are shown in Table 9. Educational levels and distribution in each group is as follows: Five participants had a level 4 education, with two in the online group and three in the control group. Seven participants had a level 5 education, with two in the in-person group, four in the online group, and one in the control group. Thirty-three participants had a level 6 education, with eleven in the in-person group, thirteen in the online group, and nine in the control group. Twenty-two participants had a level 7 education, with four in the in-person group, ten in the online group, and eight in the control group. Finally,

two participants had a level 8 education, with one in the in-person group and the other in the control group.

Regarding monthly household income, one participant indicated her household income was €0-499 and belonged to the in-person group, while another participant indicated her income was €500-999 and also belonged to the in-person group. Sixteen participants had a monthly income of €1,000-1,499, with seven belonging to the in-person group, three to the online group, and six to the control group. Fifteen participants had a monthly income of €1,500-1,999, with three belonging to the in-person group, eight to the online group, and four to the control group. Ten participants reported a monthly income of €2,000-2,499, with two belonging to the in-person group, seven to the online group, and one to the control group. Nine participants had a total income of €2,500-2,999, with one belonging to the in-person group, three to the online group, and five to the control group. Ten participants had an income of €3,000-3,499, with two belonging to the in-person group, five to the online group, and three to the control group. One participant indicated a total income of €3,500-3,999 and belonged to the in-person group. Two participants had a total income of €4,000-4,499, with one belonging to the online group and the other to the control group. Finally, four participants reported a total income of over €5,000, with two belonging to the online group and two to the control group.

Lastly, regarding participants' job rank, twenty-seven indicated no degree at all, with nine allocated to the in-person group, eight to the online group, and ten to the control group. One participant indicated she completed Junior High School studies and was allocated to the online group. Six participants completed the equivalent of Senior High School studies, with three allocated to the in-person group and three to the control group. Six participants had the equivalent of Vocational Training, with one allocated to the in-person group, four to the online group, and one to the control group. Nineteen participants reported having a College Degree, with four allocated to the in-person group, nine to the online group, and six to the control group. Finally, ten participants had a Bachelor's Degree, with one assigned to the in-person group, seven to the online group, and two to the control group.

Table 9. Participants' baseline characteristics and socioeconomic status category frequencies

	Total	In-person group	Online group	Control group
Age (years) (SD)	**32.8 (9.5)**	**34.5 (13.2)**	**31.6 (6.9)**	**33.0 (9.1)**
Educational Level				
Level 0: Early childhood education	0	0	0	0
Level 1: Primary education	0	0	0	0
Level 2: Lower secondary education	0	0	0	0
Level 3: Upper secondary education	0	0	0	0
Level 4: Post-secondary education	5	0	2	3
Level 5: Short-cycle tertiary education	7	2	4	1
Level 6: Bachelor's or equivalent	33	11	13	9
Level 7: Master's or equivalent	22	4	10	8
Level 8: Doctoral or equivalent	2	1	0	1
Income Level				
0-499€	1	1	0	0
500-999€	1	1	0	0
1,000-1,499€	16	7	2	6
1,500-1,999€	15	3	8	4
2,000-2,499€	10	2	7	1
2,500-2,999€	9	1	3	5
3,000-3,499€	10	2	5	3
3,500-3,999€	1	1	0	0
4,000-4,499€	2	0	1	1
4,500-4,999€	0	0	0	0
>5,000€	4	0	2	2
Job Rank				
Level 1	27	9	8	10
Level 2	1	0	1	0
Level 3	6	3	0	3
Level 4	6	1	4	1
Level 5	19	4	9	6
Level 6	19	1	7	2

SD: Standard Deviation

3.2.3. Results from the Pain Neuroscience Education intervention

Results describing changes in time in the assessed outcome measurements at baseline and post-intervention for every group are summarized in Table 10.

Table 10. Summary of pre and post intervention outcome measurements

Outcome	Baseline	Post-intervention	F	p-value	Size effect	Statistical power
	Mean	Mean				
VAS						
Online(n=29)	5.833	4.852	7.027	**0.013**	0.213	0.723
In-person (n=18)	5.281	3.844	9.281	**0.008**	0.382	0.812
Control (n=22)	5.091	4.864	0.460	0.505	0.021	0.099
PCS						
Online (n=29)	28.000	20.370	21.104	**0.000**	0.448	0.993
In-person (n=18)	25.188	18.938	4.114	0.061	0.215	0.475
Control (n=22)	22.409	25.273	3.809	0.064	0.154	0.461
SOPA-B						
Online (n=29)	49.593	50.926	0.310	0.582	0.012	0.084
In-person	45.063	45.188	0.002	0.966	0.000	0.050
(n=18) Control	52.364	52.409	0.000	0.991	0.000	0.050
FSFI						
Online (n=29)	19.148	20.763	1.282	0.268	0.047	0.193
In-person (n=18)	18.894	21.012	1.415	0.253	0.086	0.200
Control (n=22)	19.482	18.359	0.969	0.336	0.044	0.156

FSFI: Female Sexual Function Index; PCS: Pain Catastrophizing Scale; SOPA-B: Survey of Pain Attitudes Brief; VAS: Visual Analogue Scale. Results are presented as mean (SD).

Regarding the in-person group, significant differences ($p < 0.05$) were found in the VAS for pain intensity, decreasing from an initial 5.3 (SD 2.5) points to 3.8 (SD 2.4) points, with an estimated effect size of 0.382. There were non-significant changes in the other outcomes. For the PCS ($p = 0.061$), a change was observed from 25.2 (SD 12.7) points to 18.9 (SD 12.5) points, with an estimated effect size of 0.215. In the SOPA-B ($p = 0.966$), scores changed from 45.1 (SD 10.6) to 45.2 (SD 14.5) points, with an estimated effect size of 0.000. For the FSFI ($p = 0.253$), a change was noted from 18.9 (SD 7.8) to 21 (SD 9.5) points, with an estimated effect size of 0.086.

In the online group, significant differences ($p < 0.05$) were observed in pain intensity measured with the VAS, which decreased from 5.8 (SD 2) to 4.9 (SD 2.5)

points, with an estimated effect size of 0.213. Significant differences ($p < 0.05$) were also found in the PCS, where scores changed from 28 (SD 10.4) to 20.4 (SD 11.5), with an estimated effect size of 0.448. No significant differences were found for the remaining outcomes. For the SOPA-B ($p = 0.582$), scores changed from 49.6 (13.1) to 50.2 (14.8) points, with an estimated effect size of 0.012. In the FSFI ($p = 0.268$), a change was noted from 19.1 (7.3) to 20.8 (8.1) points, with an estimated effect size of 0.047.

For the control group, no significant changes were observed in any of the outcomes. In the VAS ($p = 0.505$), scores changed from 5.1 (1.8) to 4.9 (2.2) points, with an estimated effect size of 0.021. In PCS ($p = 0.064$), scores changed from 22.4 (7.5) to 25.3 (8.2) points, with an estimated effect size of 0.154. Regarding SOPA-B ($p = 0.991$), scores remained unchanged, from 52.4 (13) to 52.4 (13.6) points, with an estimated effect size of 0.000. Lastly, for the FSFI ($p = 0.336$), scores changed from 19.5 (7.1) to 18.4 (9.3) points, with an estimated effect size of 0.044.

The Bonferroni test used to assess differences between the intervention groups indicated no significant differences in any of the outcomes when comparing the three groups. A summary can be found in Table 11.

Table 11. Differences in-between groups

Outcome	Intervention group (I)	Intervention group (J)	Mean difference (I-J)	Error dev.	Sig.	95% confidence interval	
						Inferior limit	Superior limit
VAS	**In-person (n=18)**	Online	-0.780	0.643	0.689	-2.362	0.802
		Control	-0.415	0.670	1.000	-2.062	1.233
	Online (n=29)	In-person	0.780	0.643	0.689	-0.802	2.362
		Control	0.365	0.585	1.000	-1.075	1.805
	Control (n=22)	In-person	0.415	0.670	1.000	-1.233	2.062
		Online	-0.365	0.585	1.000	-1.805	1.075
PCS	**In-person (n=18)**	Online	-2.123	2.978	1.000	-9.451	5.205
		Control	-1.778	3.101	1.000	-9.410	5.853
	Online (n=29)	In-person	2.123	2.978	1.000	-5.205	9.451
		Control	0.344	2.711	1.000	-6.327	7.015
	Control (n=22)	In-person	1.778	3.101	1.000	-5.853	9.410
		Online	-0.344	2.711	1.000	-7.015	6.327
SOPA-B	**In-person (n=18)**	Online	-5.134	3.576	0.468	-13.933	3.665
		Control	-7.261	3.724	0.167	-16.425	1.902
	Online (n=29)	In-person	5.134	3.576	0.468	-3.665	13.933
		Control	-2.127	3.255	1.000	-10.137	5.883
	Control (n=22)	In-person	7.261	3.724	0.167	-1.902	16.425
		Online	2.127	3.255	1.000	-5.883	10.137
FSFI	**In-person (n=18)**	Online	-0.002	2.343	1.000	-5.767	5.762
		Control	1.033	2.440	1.000	-4.971	7.036
	Online (n=29)	In-person	0.002	2.343	1.000	-5.762	5.767
		Control	1.035	2.133	1.000	-4.213	6.283
	Control (n=22)	In-person	-1.033	2.440	1.000	-7.036	4.971
		Online	-1.035	2.133	1.000	-6.283	4.213

FSFI: Female Sexual Function Index; PCS: Pain Catastrophizing Scale; SOPA-B: Survey of Pain Attitudes Brief; VAS: Visual Analogue Scale.

3.2.4. Correlation analysis

Results from the correlation analysis for each outcome assessed in relation to participants' age and socioeconomic status level are shown in Tables 12, 13, 14, and 15. Regarding the influence of age on the study results, there was no significant interaction ($p>0.05$). This indicates that participants improved in every outcome independently of their age or socioeconomic status.

Table 12. Results from the correlation analysis regarding age

Outcome	In-person Group		Online Group		Control Group	
	Pearson's correlation index	p-value	Pearson's correlation index	p-value	Pearson's correlation index	p-value
VAS	0.384	0.071	-0.157	0.217	0.190	0.199
PCS	0.384	0.071	-0.157	0.217	0.190	0.199
SOPA-B	-0.366	0.081	0.287	0.073	0.543	0.005
FSFI	-0.212	0.216	-0.313	0.056	0.137	0.271

FSFI: Female Sexual Function Index; PCS: Pain Catastrophizing Scale; SOPA-B: Survey of Pain Attitudes Brief; VAS: Visual Analogue Scale.

Table 13. Results from the correlation analysis regarding participants' educational level

Outcome	In-person Group		Online Group		Control Group	
	Spearman's rho	p-value	Spearman's rho	p-value	Spearman's rho	p-value
VAS	-0.044	0.871	-0.082	0.685	-0.102	0.651
PCS	-0.044	0.871	-0.082	0.685	-0.102	0.651
SOPA-B	-0.109	0.688	-0.228	0.252	-0.065	0.773
FSFI	0.061	0.823	-0.098	0.625	0.200	0.372

FSFI: Female Sexual Function Index; PCS: Pain Catastrophizing Scale; SOPA-B: Survey of Pain Attitudes Brief; VAS: Visual Analogue Scale.

Table 14. Results from the correlation analysis regarding participants' household monthly income

Outcome	In-person Group		Online Group		Control Group	
	Spearman's rho	p-value	Spearman's rho	p-value	Spearman's rho	p-value
VAS	-0.145	0.593	-0.035	0.863	0.20	0.928
PCS	-0.145	0.593	-0.035	0.863	0.20	0.928
SOPA-B	-0.080	0.768	0.22	0.265	-0.123	0.586
FSFI	0.127	0.638	0.000	0.999	0.118	0.600

FSFI: Female Sexual Function Index; PCS: Pain Catastrophizing Scale; SOPA-B: Survey of Pain Attitudes Brief; VAS: Visual Analogue Scale.

Table 15. Results from the correlation analysis regarding participants' job rank

Outcome	FG		OG		CG	
	Spearman's rho	p-value	Spearman's rho	p-value	Spearman's rho	p-value
VAS	0.117	0.666	0.089	0.658	-0.063	0.780
PCS	0.117	0.666	0.089	0.658	-0.063	0.780
SOPA-B	-0.153	0.572	-0.132	0.512	0.015	0.948
FSFI	-0.383	0.145	0.008	0.970	-0.050	0.825

FSFI: Female Sexual Function Index; PCS: Pain Catastrophizing Scale; SOPA-B: Survey of Pain Attitudes Brief; VAS: Visual Analogue Scale.

3.3. Study III: Assessing Sexual Functioning with the Female Sexual Function Index in Women Suffering from Genito-Pelvic Pain Penetration Disorder Undergoing a Therapeutic Educational Program.

3.3.1. Results of the change in the FSFI scores

The results of the change in FSFI scores among women suffering from GPPPD after participating in an educational program are presented in Table 16. Each domain of the FSFI was analyzed individually, rather than focusing solely on the total score, in order to see changes on the different domains.

In the in-person group, a significant improvement was observed in the 'pain' domain (-1.1 points, SD 1.8, $p<0.05$). The therapeutic educational program showed improvement in several domains: 'desire' (-0.3 points, SD 1.1), 'arousal' (-0.3 points, SD 1.1), 'lubrication' (-0.6 points, SD 1.8), 'orgasm' (-0.3 points, SD 1.8), and 'satisfaction' (-0.7 points, SD 1.3), though these improvements were not statistically significant.

In the online group, significant improvements ($p<0.05$) were observed in the 'satisfaction' and 'pain' domains. And improvements were noted in the 'desire' (-0.4 points, SD 1.2), 'lubrication' (-0.2 points, SD 1.5), 'orgasm' (-0.2 points, SD 2.1), 'satisfaction' (-0.8 points, SD 1.8), and 'pain' (-0.8 points, SD 1.7) domains. No improvement was observed in the 'arousal' domain.

Finally, in the control group, only the 'desire' domain showed a slight improvement (-0.2 points, SD 0.7), which was not statistically significant.

Table 16. Results of the t-test in every group for every domain

					95% CI		
Group	Domain	Mean score (PRE)	Mean score (POST)	Mean difference (SD)	Min	Max	p-value
In-person group	Desire	2.85	3.15	-0.3 (1.1)	-0.9	0.3	0.309
	Arousal	2.85	3.13	-0.3 (1.1)	1-1	0.5	0.473
	Lubrication	2.94	3.58	-0.6 (1.8)	-1.6	0.3	0.183
	Orgasm	3.35	3.60	-0.3 (1.8)	-1.2	0.7	0.587
	Satisfaction	3.93	4.56	-0.7 (1.3)	-1.3	0	0.053
	Pain	2.98	4.04	-1.1 (1.8)	-2.0	-0.1	<0.05
Online group	Desire	2.69	3.13	-0.4 (1.2)	-0.9	0	0.074
	Arousal	3.43	3.17	0.3 (1.8)	-0.5	1.0	0.466
	Lubrication	3.14	3.36	-0.2 (1.5)	-0.8	0.4	0.466
	Orgasm	3.93	4.11	-0.2 (2.1)	-1.0	0.7	0.654
	Satisfaction	3.48	4.24	-0.8 (1.8)	-1.5	-0.1	<0.05
	Pain	2.67	3.44	-0.8 (1.7)	-1.5	-0.1	<0.05
Control group	Desire	2.76	3.03	-0.2 (0.7)	-0.6	0.1	0.162
	Arousal	3.18	3.00	0.3 (1.3)	-0.3	0.9	0.287
	Lubrication	3.42	3.45	0.1 (1.3)	-0.5	0.7	0.755
	Orgasm	3.32	3.11	0.3 (1.5)	-0.4	1.0	0.372
	Satisfaction	4.22	4.00	0.4 (1.1)	-0.1	0.9	0.124
	Pain	3.34	3.40	0 (1.1)	-0.5	0.5	0.872

CI: Confidence Intervals; Max: Maximum; Min: Minimum; POST: Post-intervention; PRE: Pre-intervention; SD: Standard Deviation

3.4. Study IV: Psychometric Properties of the Translated Spanish Version of the Vaginal Penetration Cognition Questionnaire: A Preliminary Work for Validation.

3.4.1. Descriptive statistics

A total of 225 women were included in this study. Baseline demographic characteristics are shown in Table 17. The mean age of the participants was 31.3 years (SD 6.9), and they had experienced pain for an average of 24.2 months (SD 13.1). Among the sample, 123 participants (55%) were single, while 83 participants (37%) were married. The vast majority (92%) had at least completed high school. The Spanish version of the VPCQ (VPCQ-Sp) had a mean score of 95.0 points (SD 13.3).

Table 17. Participants' baseline demographic characteristics

Outcome		Mean (SD) or n (%)
Age (years)		31.3 (6.9)
Pain duration (months)		24.2 (13.1)
Marital Status	Married	83 (37%)
	Divorced	15 (7%)
	Separated	3 (1%)
	Widowed	1 (0%)
	Single	123 (55%)
Educational level		
	Uneducated	0 (0%)
	Primary	18 (8%)
	High School	116 (52%)
	College	91 (40%)

SD: Standard Deviation

3.4.2. Validity

Table 18 shows the results for the exploratory factor analysis (EFA) and the assessment of convergent and divergent validity. The KMO value for assessing sampling adequacy was 0.71, and Bartlett's test yielded a score of χ^2 = 1,868.08 ($p < 0.001$). The EFA identified a total of four domains: (1) Control cognitions, (2) Catastrophic and pain cognitions, (3) Self-image cognitions, and (4) Positive cognitions, which together accounted for 62.5% of the variance in the VPCQ-Sp

items. The first domain, "Control cognitions," explained 8.6% of the variance; the second domain, "Catastrophic and pain cognitions," explained 17% of the variance; the third domain, "Self-image cognitions," explained 14.6% of the variance; and the fourth domain, "Positive cognitions," explained 22.3% of the variance. The average variance extracted (AVE) values were 0.513 for "Control cognitions," 0.621 for "Catastrophic and pain cognitions," 0.585 for "Self-image cognitions," and 0.601 for "Positive cognitions." All AVE values were between 0.5 and 0.7, indicating acceptable convergent validity. Additionally, all maximum shared variance (MSV) values were below the AVE values, confirming discriminant validity.

Table 18. Exploratory factor analysis results, convergent and discriminant validity of the Spanish version of the VPQC

Domain	Mean (SD)	Loading	Variance (%)	AVE	MSV
1. Control cognitions			8.6	0.513	0.387
Item 2. Tengo miedo de perder el control de la situación durante la penetración.	5.1 (1.2)	0.692			
Item 6. Tengo miedo de entrar en pánico durante la penetración.	4.5 (2.3)	0.809			
Item 20. Tengo miedo de no poder influir sobre lo que sucede durante la penetración.	5.0 (1.4)	0.718			
Item 21. No saber que ocurre en mi cuerpo durante la penetración me da miedo.	5.7 (0.3)	0.662			
2. Catastrophic and pain cognitions			17.0	0.621	0.515
Item 5. Lo más seguro es que la penetración no sea posible.	4.9 (1.2)	0.733			
Item 7. Tengo miedo de que la penetración se vuelva más difícil en un futuro.	5.1 (1.8)	0.660			
Item 9. Tengo miedo de que el dolor en la penetración vaya a más en un futuro.	5.3 (0.9)	0.666			
Item 11. Seguramente la penetración no se podrá realizar.	5.6 (1.4)	0.693			
Item 13. El pene de mi pareja es demasiado grande para mi vagina.	3.1 (2.3)	0.527			
Item 16. Tengo miedo de sentir calambres durante la penetración.	4.5 (0.8)	0.748			
3. Self-image cognitions			14.6	0.585	0.515
Item 1. Tengo miedo de que mi vagina sea demasiado estrecha para la penetración.	4.5 (0.7)	0.497			

Item 8. Sólo me siento una "mujer completa" cuando la penetración es posible.	2.1 (1.3)	0.707			
Item 10. Soy una mala pareja cuando la penetración no es posible.	2.5 (1.0)	0.715			
Item 15. Soy la única en el mundo con la que la penetración no es posible.	2.8 (1.5)	0.524			
Item 17. Me siento culpable cuando la penetración no es posible.	5.5 (0.9)	0.635			
Item 19. Tengo miedo de que mi pareja me deje porque la penetración no es posible.	3.8 (2.7)	0.786			
4. Positive cognitions			22.3	0.601	0.301
Item 3. Siento que la penetración será agradable.	4.0 (1.6)	0.744			
Item 4. La penetración es un momento de intimidad con mi pareja.	5.3 (0.5)	0.623			
Item 12. Me excitaré sexualmente con la penetración.	4.0 (1.3)	0.762			
Item 14. La penetración será agradable.	4.2 (2.1)	0.857			
Item 18. La penetración acabará en un orgasmo.	4.8 (1.3)	0.613			
Item 22. Aunque la penetración no sea posible soy una buena pareja sexual.	3.6 (1.3)	-0.663			

AVE: Average Variance Extracted; MSV: Maximum Shared Variance; SD: Standard Deviation

3.4.3. Test-retest reliability

Results of the test-retest reliability are shown in Table 19. The overall intraclass correlation coefficient for the VPCQ-Sp was 0.90 (95% CI 0.85-0.93). Of the total 22 items, 20 showed high correlation levels (items 1-7, 9, 11-12), with correlation values ranging from 0.80 to 0.97. The remaining two items (8 and 10) showed average correlation levels of 0.75 and 0.78, respectively. The standard error of measurement (SEM) was 4.21, and the minimal detectable change (MDC) was 11.66 points.

Table 19. Intraclass correlations of the items in the Spanish version of the VPCQ

Item	Description	ICC	95% CI	SEM	MDC
1	Tengo miedo de que mi vagina sea demasiado estrecha para la penetración	0.85	0.74-0.94		
2	Tengo miedo de perder el control sobre la situación durante la penetración	0.81	0.78-0.84		
3	Siento que la penetración será agradable	0.80	0.71-0.88		
4	La penetración es un momento de intimidad con mi pareja	0.95	0.88-0.97		
5	Lo más seguro es que la penetración no sea posible	0.92	0.87-0.95		
6	Tengo miedo de entrar en pánico durante la penetración	0.86	0.80-0.89		
7	Tengo miedo de que la penetración se vuelva más difícil en un futuro	0.86	0.82-0.93		
8	Solo me siento una "mujer completa" cuando la penetración es posible	0.75	0.68-0.79		
9	Tengo miedo de que el dolor en la penetración vaya a más en un futuro	0.95	0.92-0.97		
10	Soy una mala pareja cuando la penetración no es posible	0.78	0.70-0.81		
11	Seguramente la penetración no se podrá realizar	0.90	0.86-0.93		
12	Me excitaré sexualmente con la penetración	0.93	0.91-0.96		
13	El pene de mi pareja es demasiado grande para mi vagina	0.85	0.73-0.95		
14	La penetración será agradable	0.93	0.89-0.95		
15	Soy la única en el mundo con la que la penetración no es posible	0.82	0.79-0.83		
16	Tengo miedo de sentir calambres durante la penetración	0.94	0.92-0.98		
17	Me siento culpable cuando la penetración no es posible	0.92	0.90-0.95		
18	La penetración acabará en un orgasmo	0.90	0.87-0.92		
19	Tengo miedo de que mi pareja me deje porque la penetración no es posible	0.82	0.79-0.84		
20	Tengo miedo de no poder influir sobre lo que sucede durante la penetración	0.95	0.93-0.96		
21	No saber qué ocurre en mi cuerpo durante la penetración me da miedo	0.97	0.95-0.98		
22	Aunque la penetración no sea posible, soy una buena pareja sexual	0.88	0.85-0.90		
TOTAL		0.90	0.85-0.93	4.21	11.66

CI: Confidence Intervals; ICC: Intraclass Correlation Coefficient; MDC: Minimal Detectable Change; SEM: Standard Error of Measurement.

3.4.4. Internal consistency

Every domain showed good internal consistency (Cronbach's α > 0.8). Cronbach's α values were 0.89 (95% CI 0.87-0.92) for the first domain, "Control cognitions"; 0.84 (95% CI 0.81-0.86) for the second domain, "Catastrophic and pain cognitions"; 0.86 (95% CI 0.83-0.89) for the third domain, "Self-image cognitions"; and 0.84 (95% CI 0.82-0.87) for the fourth domain, "Positive cognitions," as shown in Table 20.

Table 20. Internal consistency coefficients of the factors of the Spanish version of the VPCQ

Domain	Cronbach's α (95% CI)
1. Control cognitions	0.89 (0.87-0.92)
2. Catastrophic and pain cognitions	0.84 (0.81-0.86)
3. Self-image cognitions	0.86 (0.83-0.89)
4. Positive cognitions	0.84 (0.82-0.87)

CI: Confidence Intervals

3.5. Study V: Graded Motor Imagery is effective in women suffering Genito-Pelvic Pain Penetration Disorder. A Randomized Controlled Trial.

3.5.1. Participants

Ninety-six participants were initially recruited for the study from April until May 2023. Nine participants were excluded for not experiencing pain for more than six months, leaving a total of 87 participants for randomization. 43 participants were assigned to the GMI group and 44 to the control group. Four women decided not to continue with the intervention, leaving a total of 83 participants for analysis. The participant flow chart is shown in Figure 8.

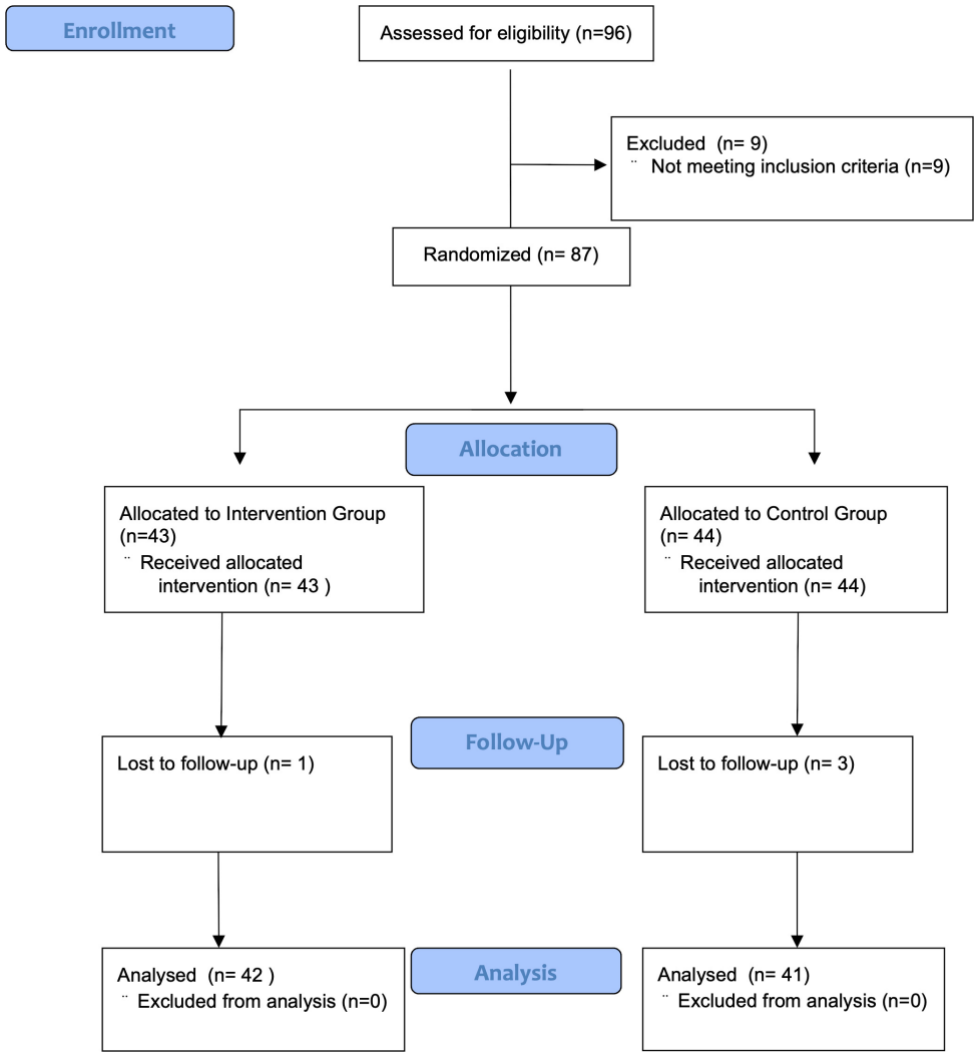


Figure 8. Participant Flow Diagram

Follow-up assessments were conducted every two weeks over a six-week period. The sociodemographic characteristics of the participants are detailed in Table 21. No significant differences were observed between the two groups.

Table 21. Baseline demographic characteristics of the participants

	GMI Group (n=42)	Control Group (n=41)	Total (n=83)
Age (years (SD))	35.6 (10.6)	35.5 (9.9)	35.5 (10.2)
Educational level			
Level 0: Early childhood education	0 (0%)	0 (0%)	0 (0%)
Level 1: Primary education	0 (0%)	0 (0%)	0 (0%)
Level 2: Lower secondary education	1 (2.4%)	0 (0%)	1 (1.2%)
Level 3: Upper secondary education	3 (7.1%)	2 (4.9%)	5 (6%)
Level 4: Post-secondary education	1 (2.4%)	5 (12.2%)	6 (7.2%)
Level 5: Short-cycle tertiary education	6 (14.3%)	7 (17.1%)	13 (15.7%)
Level 6: Bachelor's or equivalent	15 (35.7%)	15 (36.6%)	30 (36.1%)
Level 7: Master's or equivalent	16 (38.1%)	10 (24.4%)	26 (31.3%)
Level 8: Doctoral or equivalent	0 (0%)	2 (4.9%)	2 (2.4%)
Marital status			
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			
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)

CPPQ: Chronic Pelvic Pain Questionnaire; GMI: Graded Motor Imagery; MIQ-R: Movement Imagery Questionnaire Revised; SD: Standard Deviation; VPCQ: Vaginal Penetration Cognition Questionnaire

3.5.2. Results from the Graded Motor Imagery intervention

ANOVA results, presented in Table 22, show a significant improvement in pain intensity within subjects ($p < 0.05$) and a non-significant improvement in the control group. In the between-subject analysis, there is a significant difference in pain improvement in the GMI group compared to the control group.

When considering sexual function, participants in the GMI group exhibited a non-significant improvement on the FSFI, whereas the control group showed deterioration. Between-group analysis revealed no significant differences between the two groups.

Table 22. Results of a mixed-design two-way repeated measures ANOVA

Outcome	Group	Mean (SD)		Time, p-value	Effect size	Group-Time, p-value	Effect size
		PRE	POST				
VAS (points (SD))	GMI	6.9 (1.3)	4.7 (1.3)	F=41.586	η_p^2=0.339	F=25.393	η_p^2=0.239
	Control	6.9 (1.5)	6.7 (1.5)	p<0.05		p<0.05	
FSFI (points (SD))	GMI	16.5 (3.9)	16.6 (3.7)	F=0.198	η_p^2=0.002	F=0.820	η_p^2=0.010
	Control	16.1 (4.6)	15.5 (4.7)	p=0.657		p=0.368	

FSFI: Female Sexual Function Index; GMI: Graded Motor Imagery; POST: Post-intervention; PRE: Pre-intervention; SD: Standard Deviation; VAS: Visual Analogue Scale

3.5.3. Correlation analysis

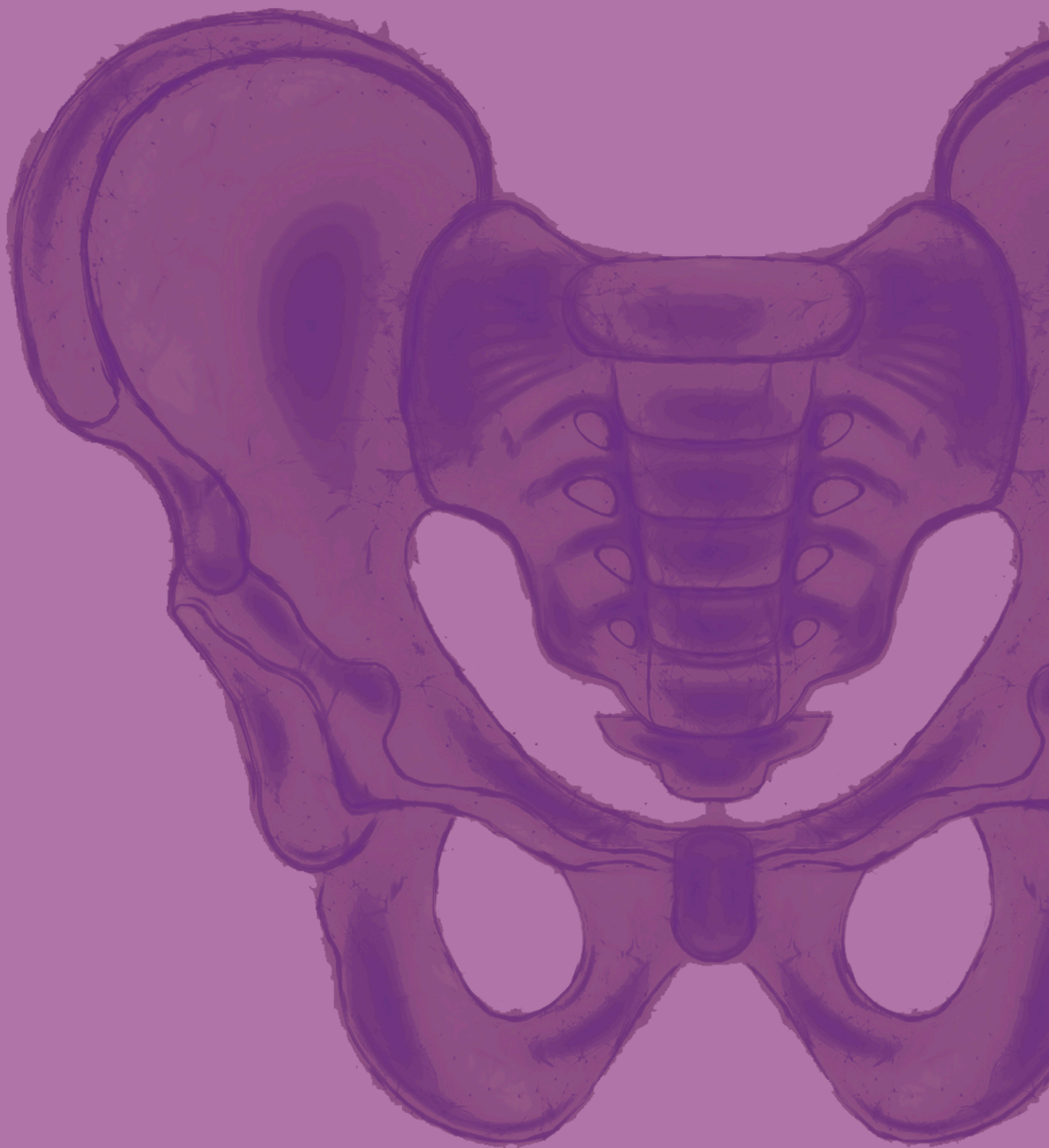
A correlation analysis between age, capacity for imagination, and vaginal penetration cognitions is presented in Table 23. It indicates a negative correlation between pain outcomes and imagination capacity in the GMI group, suggesting that participants with higher MIQ-R scores, indicative of better imagination capacity, obtained lower scores on the VAS. Similarly, a negative correlation is observed between sexual function and the cognition of vaginal penetration in the control group, where higher scores on the VPCQ corresponded to lower FSFI scores.

Table 23. Results of the correlation analysis between results and participants' age, ability to imagine and vaginal penetration cognitions

Variable		GMI Group		Control Group	
		Pearson's correlation index	p-value	Pearson's correlation index	p-value
Age	VAS	0.013	p=0.466	0.106	p=0.255
	FSFI	-0.049	p=0.379	0.004	p=0.489
MIQ-R	VAS	-0.328	p<0.05	0.040	p=0.401
	FSFI	0.142	p=0.185	0.109	p=0.249
VPCQ	VAS	0.234	p=0.068	0.256	p=0.053
	FSFI	-0.205	p=0.096	-0.412	p<0.05

FSFI: Female Sexual Function Index; GMI: Graded Motor Imagery; MIQ-R: Movement Imagery Questionnaire Revised; VAS: Visual Analogue Scale; VPCQ: Vaginal Penetration Cognition Questionnaire

Chapter 4.
DISCUSSION



4. Discussion

This doctoral thesis aimed to enhance the understanding of Genito-Pelvic Pain/Penetration Disorder and explore conservative treatment approaches beyond conventional methods. There is a gap in the understanding of GPPPD among health care providers so treatment options are scarce. Physiotherapists specialized in pelvic health struggle finding treatment options available and with evidence for GPPPD.

The initial study investigated the current societal knowledge of this diagnosis, using the term Dyspareunia due to its broader familiarity compared to the more specific Genito-pelvic pain/penetration disorder. A search on YouTube was conducted as it serves as a widely accessible platform for information, despite lacking formal peer review and oversight, which can potentially result in dissemination of misleading or harmful information. Study I revealed that although Health Organizations uploaded the majority of the videos on Dyspareunia, these did not consistently demonstrate the highest quality. Notably, only 15% of videos produced by Academic Institutions attained the highest quality scores among those analyzed.

The second study aimed to identify a straightforward, conservative solution for women diagnosed with GPPPD who seek information online. Given the questionable quality of information on platforms like YouTube, which may not adequately equip individuals to understand their condition, an alternative approach focused on delivering high-quality education was explored. Study II implemented a Pain Neuroscience Education program targeting two intervention groups — one receiving in-person sessions and the other accessing the program online — alongside a control group for comparison. This dual intervention approach demonstrated that online educational resources can offer quality information beneficial to women with internet access. After demonstrating its effectiveness in reducing pain intensity — particularly beneficial for women lacking access to nearby hospitals or clinics — the question arose whether this tool could benefit women across all socioeconomic statuses. The results indicated improvements independent of age, educational level, household monthly income, or job rank.

Although significant changes in pain intensity were observed in the intervention group, no changes were noted in sexual function as assessed by the FSFI. The FSFI evaluates six domains — Desire, Arousal, Lubrication, Orgasm, Satisfaction, and Pain — within a single questionnaire. The third study analyzed each domain individually to determine if there were significant changes in any specific domain rather than in the total score alone. Results indicated improvements across all domains, with statistically significant changes observed only in the Pain domain for the in-person group. In the online group, improvements were noted in all domains except 'Arousal', with statistically significant changes observed in the 'Satisfaction' and 'Pain' domains. Although the total score did not show significant differences, the Pain and Satisfaction domains exhibited significant changes in the intervention groups.

Vaginal penetration cognitions can significantly impact women's sexuality, and a valuable tool for assessing beliefs and emotions related to vaginal penetration is the Vaginal Penetration Cognition Questionnaire (VPCQ). Given that these studies were conducted with a Spanish-speaking population, a validated Spanish version of the VPCQ was developed (Study IV). Results demonstrated that the Spanish version of the VPCQ is a valid, reliable, and consistent instrument for assessing beliefs and thoughts concerning vaginal penetration among women suffering from Genito-Pelvic Pain/Penetration Disorder (GPPPD). Exploratory factor analysis identified four domains that collectively explained 62.5% of the variance. Convergent and discriminant validity were confirmed, test-retest reliability was high, and each domain exhibited good internal consistency.

This validated version of the VPCQ was subsequently utilized as a measurement tool in the final study. Given the scarcity of effective and conservative treatments for Genito-Pelvic Pain/Penetration Disorder (GPPPD), and drawing on research into treatments for disorders with similar etiology, such as persistent pain conditions, Graded Motor Imagery (GMI) emerged as a commonly utilized approach. With no prior studies on GMI in women with GPPPD, the fifth study aimed to implement a comprehensive GMI program for this population. The results were promising, showing a significant reduction in pain intensity.

4.1. Study I: Educational videos about dyspareunia and the assessment of their quality and reliability: An observational study.

The aim of this study was to evaluate the quality of information available on YouTube. To our knowledge, no other studies have reviewed the educational content of dyspareunia on YouTube specifically.

Dyspareunia is a prevalent sexual dysfunction characterized by pain during sexual intercourse. Inadequate education about sexual dysfunctions can exacerbate pain and lead to both sexual and emotional consequences. Education plays a crucial role in enhancing awareness of the condition, and the lack of understanding of its pathology is directly linked to insufficient information availability to the general population. With the rapid advancement of technology, online education has gained significance. Research has shown that both students and educators utilize the Internet extensively to access information on educational subjects (70,71).

Nowadays, the Internet has become the primary source of information, not only for patients but also for professionals. It's been documented that approximately 7% of the daily Google searches worldwide are health-related (72). YouTube ranks as the second most accessed website globally, with approximately 34.6 billion monthly visits, making it the largest video archive website (73). YouTube is a freely accessible video-sharing website with a vast library of health-care related videos uploaded by various users, including individuals, academic institutions, and health organizations. Professionals have extensively utilized this platform for training in various surgical procedures (74–77) and also by users as an educational source of information (78–81). Due to the significance of education concerning certain pathologies and the Internet's expansive growth as a critical information source, it is imperative to assess the quality of online content. While the Internet offers numerous benefits, it also carries risks associated with unfiltered content. YouTube, being a non-peer-reviewed platform, allows for the uploading of videos without evaluation. This lack of evaluation can create confusion among professionals and consumers alike, and may disseminate inaccurate information, potentially causing harm to viewers.

In this study, 40 videos focusing on Dyspareunia were analyzed, collectively amassing a mean total of over 35 million views. This highlights YouTube's popularity as a go-to platform for information on Dyspareunia. The average duration of these 40 videos was 5 minutes and 39 seconds. This average duration is slightly shorter than reported in other studies, with health education video lengths ranging from 6 minutes and 17 seconds to 10 minutes and 35 seconds (82–84).

When analyzing the sources of the videos, it was found that the highest percentage were produced by Health Organizations. Despite their prevalence, these videos did not demonstrate the highest quality. Surprisingly, videos uploaded by Academic Institutions, which constituted only 15% of the analyzed videos, exhibited the highest quality. This low representation of videos from Academic Institutions aligns with findings from similar studies indicating that such institutions are underrepresented in the production of educational content on platforms like YouTube. (84). The shortage of high-quality videos about Dyspareunia on platforms like YouTube can potentially lead to misinformation and misunderstanding of the disorder. Contrarily, a related study discovered that the highest quality videos were those uploaded by Physicians affiliated with academic institutions (82). This difference in findings between our study and others may stem from the nature of the condition being discussed, as dyspareunia could be less commonly searched due to its association with taboo and sexual concerns. Studies examining internet videos for various urogynecological conditions, such as varicocele and erectile dysfunction, have also indicated poor video quality. These disparities underscore the need for more comprehensive and accurate educational resources across all aspects of sexual and reproductive health (85,86).

Based on the country of origin, the largest percentage of videos were produced in the U.S.A. However, upon analyzing the quality, these videos did not rank highest in quality. This reinforces the idea that a higher quantity of videos from a particular country does not necessarily correlate with better quality. In contrast, videos produced in Nigeria showed better quality, suggesting that a country's development and economic status may not be directly related to the production of high-quality educational videos. Consumers should approach these findings

cautiously, avoiding assumptions that higher quantity equates to higher quality in educational content.

Other studies have not only focused on YouTube but have also assessed other social media platforms such as TikTok. However, videos on TikTok generally showed poorer quality scores compared to those on YouTube (85), which might be because of the length permitted on each video. It would be useful for further studies on dyspareunia to compare information online, not only on YouTube but also on platforms like TikTok or Instagram. Vicente-Neira et al. explored information on female sexual disorders, not limited to video formats, but also across various websites (87), concluding the average quality of the results were classified as "very low." Once again, healthcare providers should be aware of the low quality of health-related information available on the Internet that their patients might encounter, and they should caution them about the risks associated with accessing incorrect information.

A limitation of this study was the choice of search terms. Dyspareunia was selected because it is more technical than "sexual pain" but less precise than "genito-pelvic pain/penetration disorder." This decision restricted the scope of the videos analyzed, as many women may have used different terms and thus found videos that were not evaluated in this study. Suggestions for future research include evaluating videos found using various search terms and comparing their quality. Additionally, comparing the quality of videos across different platforms could provide further insights into the availability and reliability of online information on dyspareunia.

As Academic Institutions are the ones that have uploaded videos with better quality, they should be the ones in charge of developing a larger number of videos so overall quality of content on YouTube improves. Future studies should focus on the development of high quality videos on YouTube about dyspareunia in order to improve the awareness of the general population on this condition.

4.2. Study II: Association Levels Between Results from a Therapeutic Educational Program on Women Suffering from Genito-Pelvic Pain Penetration Disorder and Their Socioeconomic Status.

This study aimed to evaluate the effectiveness of a Pain Neuroscience Education (PNE) program for women diagnosed with GPPPD and assess the correlation levels of its results with the participants' socioeconomic status (SES). Significant improvements in pain intensity levels were found independent of educational level, household monthly income, and job rank. The fact that both interventional groups were not influenced by SES is positive, as it shows that the interventions were generalizable in the population. This also means the PNE program is accessible in terms of comprehension, regardless of SES.

Patient education focused on pain management should be considered essential in standard care, particularly for persistent pain conditions. Persistent pain is multifaceted and can significantly impact patients negatively. PNE is a cost-effective treatment approach that enhances patient understanding of the biopsychosocial aspects of pain. It helps individuals re-conceptualize pain as less threatening, thereby improving self-management and overall quality of life (88,89). Reviews on the management of GPPPD explore various interventions, with common treatment approaches studied including physiotherapy, surgery, pharmacology, electromyography biofeedback, cognitive behavioral therapy, psychoeducation, and gradual exposure (5,8), but not including a PNE program. Rarely is education considered a primary treatment option, with pharmacology or other treatments typically prioritized initially. However, integrating patient education with multidisciplinary treatment options could optimize medication use, reduce pain catastrophizing, and decrease reliance on secondary care treatments (89). In the past two decades, there has been a notable increase in studies delivering PNE demonstrating favorable results across various pain conditions (88,90–92). Given the growing importance of education and the benefits demonstrated in various studies, PNE should be considered and included as a treatment option to enhance understanding and beliefs related to persistent pain conditions (93).

To our knowledge, this study is the first to implement PNE in women diagnosed with GPPPD. The absence of trials on PNE for GPPPD may be attributed

to challenges in nomenclature or overlapping diagnoses with other disorders, such as vaginismus, vulvodynia, or chronic pelvic pain, for which educational programs have been applied (21,25,33). These conditions have in common the presence of pain during sexual intercourse. A similar program evaluated in another study involving women with vaginismus also reported significant differences in both intervention groups concerning the achievement of penetration, although pain intensity was not specifically measured (29,94). This study and ours both included anatomy, pain education, sexual education, and a guide for gradual exposure exercises.

Nigaard A et al. (95) integrated patient education, body awareness therapy, and a cognitive approach in women with chronic pelvic pain (CPP) in a group-based setting, similar to our in-person intervention group. However, their findings contrast with ours, as their group-based educational intervention did not result in reduced pain intensity. This disparity may stem from CPP's multifaceted nature, where pain represents just one facet of the condition, unlike GPPPD, which primarily involves issues with vaginal penetration. The reduction in pain intensity observed in our study with a PNE program could be attributed to the unique characteristics of GPPPD. Enhancing understanding of the condition empowers patients, diminishes negative pain beliefs, particularly in such intricate contexts (96). PNE has also been used for other complex conditions such as fibromyalgia (97) with promising results. Also, another systematic review comprises the use of PNE in central sensitization conditions (98).

Sexual function did not exhibit statistically significant differences. This could be attributed to the focus of PNE primarily on pain reduction rather than sexual function. Most studies employing PNE assess changes in pain intensity, disability, and psychosocial factors. PNE aims not only to enhance understanding of pain but also to facilitate behavioral changes in complex conditions (96). This facilitates a deeper understanding of the complex biology occurring in patients. Sexual function is a mechanism were changing behavior and understanding what is happening in the body can improve it. Another reason why our study may not have shown significant change could be the duration of the intervention. Other studies assessing sexual function had interventions ranging from 8 weeks to 6 months. Backman et al.

(99) found that after 6 months of education and pelvic floor physiotherapy, sexual function improved significantly compared to our study. They did not measure sexual function using the FSFI, and their population did not have GPPPD.

It remains uncertain whether the improvement found is attributable to the duration of the intervention or the combination of therapies. In persistent pain conditions, education alone can have an impact, but when combined with other therapies, its benefits are enhanced, such as through increased patient confidence and self-management of the condition (89). This could be another reason for the non-significant change in our results. Other studies incorporating educational therapy have also included additional physical therapy techniques such as manual therapy or exercise (98). Vittrup G et al. (100) employed a program similar to our PNE intervention for a different sexual dysfunction condition, using an 8-week intervention period that significantly improved FSFI scores. Although the intervention duration is comparable to ours, one notable difference, besides the condition studied, is their encouragement of partner involvement in the intervention. Women who engaged their partners showed better outcomes compared to those who did not. Given that sexual relationships involve partners, couples therapy could be a valuable addition to our intervention for future research.

The vast majority of women with GPPPD do not seek treatment initially when feeling distressed, and the reasons for this include sexual dysfunction being a taboo subject, feelings of embarrassment, shame, or because they do not know any health professionals specialized in such topics (30), plus during the COVID-19 pandemic, most clinical practices closed and hospitals reduced treatment. Having online interventions increases the accessibility of treatment options for many women, offering several advantages: availability—available for all women ready to start treatment; accessibility—accessible anytime, anywhere with an Internet connection; anonymity—women can access treatment without feeling embarrassed; flexibility—women can work at their own pace and review content as needed; and providing options for women not living near hospitals or clinical practices. There are other studies that have also shown the effectiveness of an internet-based therapy on other sexual dysfunctions (101) or anxiety and

depression (102), meaning that online interventions are helpful for many pathologies and are increasing in the last years.

Regarding socioeconomic status, people with a lower SES are associated with greater pain and disability and are at risk of having poorer pain treatment compared to those in a middle or higher SES (103). Additionally, socioeconomic status has been shown to have direct influence on the physical and mental health of individuals due to financial issues, access to interventions, and low adherence to medical treatment (104). Studies have found low SES produced poorer health outcomes in conditions with pain-processing dysfunctions, such as fibromyalgia (105) or musculoskeletal pain (106). This study shows promising results as even people with low SES can have access to treatment options regarding pain intensity.

Not only was SES independent of the results, but age was also not a relevant factor. Our study had a relatively young sample with a mean age of 32.5 years. Fitzcharles et al. (105) found a correlation between results and age in an older population that included both genders, suggesting that both gender and age could be relevant; however, that study focused on women with fibromyalgia. On the other hand, Newman et al (107) found a negative correlation between age and chronic pain, indicating that older adults tend to report fewer pain-related variables, such as pain catastrophizing and pain severity. Compared to younger adults, it is possible that older adults have already learned protective or emotional resources to deal with chronic pain, while younger adults have fewer resources, making pain a more potential threat, resulting in more intense pain and pain catastrophizing.

There are no studies assessing how SES affects the results of an educational program on pain conditions, so it is hard to compare our results with other studies. However, regarding pain, studies have evaluated the association between SES and the evolution of pain. It has been demonstrated that there is a higher prevalence of chronic pain within a low-income and low-education population (108–111). This can be associated with the elevated stress that pain can cause due to lower income, the higher necessity of being able to work, and lower possibilities to have access to adequate treatment. These factors can further exacerbate pain catastrophizing, thereby increasing pain severity (107).

In this study the correlation analysis was done through Pearsons' correlation index and Spearman's rho statistics. Other studies used between-group comparisons with a t-test (112), multiple hierarchical regression analysis (44) or Poisson regression analysis (113). Since there is no gold standard statistical analysis, we opted to replicate the statistical methods used in similar studies to establish correlation levels. Specifically, Pearson's correlation coefficient was used to correlate continuous variables (such as results and age) (113), while Spearman's rho statistic was employed to correlate continuous variables (results) with categorical variables (education level, household income, and job rank) (112).

One of the limitations of this study pertains to the assessed population. Since one of the intervention groups was conducted online, a key inclusion criterion was access to a device connected to the Internet. This requirement may have excluded individuals from populations with lower SES who might not have access to the Internet, potentially limiting their participation. Although SES did not show a correlation with the results in our study, this lack of correlation could be influenced by the exclusion of women with low SES due to access limitations.

Another limitation concerns age. Our study did not find any correlations between age and the results. Given that the average age of the participating women in the study is relatively young (32.5 years old), it is possible that older women did not have access to devices with Internet connectivity and therefore did not participate in the study.

Finally, during our intervention, we observed limited attendance at the in-person sessions due to work, family, or leisure commitments. Online interventions address this limitation by allowing each woman to choose a time that suits her schedule, without depending on others. Some online intervention studies have scheduled meetings to increase attendance, or participants are supported by an eCouch as guidance (29,30). This approach helps health professionals mitigate the risk of participants undergoing treatment without adequate knowledge. One disadvantage of online interventions is the challenge of assessing each patient's capabilities accurately (29). In our study, participants were provided with an email for any doubts, and they had access to a comment section for every video uploaded to ask questions or leave comments.

4.3. Study III: Assessing Sexual Functioning with the Female Sexual Function Index in Women Suffering from Genito-Pelvic Pain Penetration Disorder Undergoing a Therapeutic Educational Program.

This study evaluated the impact of a Pain Neuroscience Education program on women diagnosed with GPPPD regarding their sexual function, using the FSFI to assess each of its domains. There was a trend to improve across nearly all domains. Significant improvements were observed in the "Pain" domain in both groups, while the online group also showed significant improvement in the "Satisfaction" domain. Thus, these results suggest that a PNE program, whether delivered in-person or online, has the potential to enhance sexual functioning.

The online group showed higher significant changes, which could be attributed to the advantages of online interventions. Since the onset of COVID-19, there has been a decrease in in-person attendance at hospitals, group activities, and exercise routines, making online interventions necessary (114). The advantages of online treatment, such as access to content whenever and wherever participants want, have made this type of intervention attractive for participants.

The program included not only PNE but also addressed issues related to sexual functioning, covering information for every domain assessed on the FSFI (Desire, Arousal, Lubrication, Orgasm, Satisfaction, Pain). Other studies have also analyzed each domain of the FSFI. Gunst et al. (115) conducted a study involving Finnish women without sexual dysfunction and found that specific environmental factors related to each partner could contribute to female sexual dysfunctions. They highlighted that the domains of "desire" and "orgasm" appear to be independent of the partner. They suggested that psychobehavioral interventions targeting associated environmental factors hold promise for treating female sexual dysfunctions. Perhaps our study could have benefited from a greater focus on partner-related factors when analyzing sexual functioning.

Another study used FSFI in women diagnosed with Sexual Interest/Arousal Disorder (SIAD). SIAD, as outlined in the DSM-5, is characterized by deficiencies in sexual desire and arousal, similar to GPPPD but with a distinct focus on these aspects of sexual dysfunction. Brotto et al. (116) compared two group interventions: one treatment group completed eight weekly psychoeducation sessions, while the other

group had the same intervention supplemented with a mindfulness program. The group that included mindfulness showed more significant improvements. Mindfulness enhances awareness of bodily sensations, which can increase sexual desire. Our study could have incorporated a mindfulness program to enhance other aspects of the FSFI, beyond pain, as sexual function requires heightened interoceptive awareness focused on sexual sensations.

The development of an effective pain and sexual educational program is beneficial for the day-to-day care of patients diagnosed with any sexual disorder, such as GPPPD. Often healthcare providers have very few resources when approaching this condition (117), and having these types of interventions that require no cost-investment or any negative complications could significantly improve their management of these patients. Research is available on other therapies such as trigger point therapy, biofeedback, or exercise, but their evidence is scarce and these interventions focus on pain not sexual function (118).

Improvements in the sexual function domain in this study were non-significant. This may be attributed to the duration of the intervention. To achieve significant results, a longer program may be necessary. Additionally, including more comprehensive content on sexuality, possibly with the assistance of a multidisciplinary team, could have enhanced outcomes, given that the program was solely conducted by physiotherapists.

Other study limitations include the randomization process. To ensure participants could attend the in-person intervention, they were categorized as being geographically ‘close’ or ‘not close’ prior to randomization. This approach may not fully reflect the realities of implementing educational programs, where physical attendance could restrict patient access to treatment. However, our results demonstrate that both intervention groups showed significant improvements, justifying the consideration of offering online interventions directly to address these limitations.

4.4. Study IV: Psychometric Properties of the Translated Spanish Version of the Vaginal Penetration Cognition Questionnaire: A Preliminary Work for Validation.

This is the first study assessing the psychometric properties of the Spanish version of the VPCQ (VPCQ-Sp). The VPCQ was initially developed by Klaassen and Ter Kuile (119) in English, and they proved it to be a reliable and valid instrument for assessing vaginal penetration cognitions in a Dutch population. Later on, Dogan et al. (120) and Banaei et al. (121) developed translated versions into Turkish and Persian, respectively. Our results show that VPCQ-Sp has high test-retest reliability, excellent internal consistency levels, and acceptable convergent and discriminant validity.

The studies mentioned above conducted the analysis in samples of women diagnosed with dyspareunia and vaginismus, in comparison to our study, which was aimed at women diagnosed with GPPPD. Although vaginismus and dyspareunia are two different diagnoses, they are both included in the GPPPD diagnosis in the DSM-5, and it is found that both have no differences in the reported level of pain (122,123). Despite the diagnosis, our sample included women with an educational level and age similar to those in the original version and the Persian version, so our results are consistent with them.

In our study, the exploratory factor analysis (EFA) yielded four domains (control cognitions, catastrophic and pain cognitions, self-image cognitions, and positive cognitions). The original version included genital incompatibility as a fifth domain. This can be explained as the authors suggest that 'vaginismus' is a 'phobia' to vaginal penetration, so considering genital incompatibility as a relevant domain might be connected with this fear-avoidance behavior rather than with the actual condition (119). Furthermore, our EFA also contrasts with the Persian translated version, as authors yielded three domains, combining 'catastrophic and pain cognitions,' 'control cognitions,' and 'genital incompatibility' into one domain: 'catastrophic and control cognitions.' These differences between each version might be due to the cultural setting in which they are conducted, as well as the language variations of some of the items depending on the country. Moreover, even within the same country, there are multi-cultural regions, and the authors of the Persian

version suggest assessing differences between samples from the same country, as different regions could present different results (121). On the other hand, the same language might be used in different countries, such as Spanish. Our study was conducted with women from Spain, but culture might differ in other Spanish-speaking countries such as Argentina or Mexico.

Convergent and discriminatory validity values showed acceptable validity, with all items above 0.5 on the Average Variance Extracted (AVE), and AVE values higher than Maximum Squared Shared Variance (MSV). This aligns with the Persian translated version, which had similar convergent validity values, although their discriminatory validity was not confirmed, leading to a second confirmatory factor analysis in their study. These differences may be due to the social and cultural background of each country when assessing these items, as sexual problems are highly dependent on the social matters of each society due to their 'taboo' nature (121).

The test-retest reliability results are consistent with those in the original and translated versions. In this study, 20 items showed a high correlation, ranging from 0.80 to 0.97 on the ICC. However, items 8 and 10 showed average correlation. These items deal with concepts such as “being a complete woman” or “being a good partner” which are ambiguous and can be interpreted differently, not only within the same country but also within the same sample.

Good internal consistency was found in this study using Cronbach’s α, with results ranging from 0.84 to 0.89. Similar Cronbach’s α results have been reported in other studies: ranging from 0.70 to 0.83 in the original version, 0.82 to 0.93 in the Persian translated version, and 0.71 to 0.92 in the Turkish translated version. However, the Persian version also assessed composite reliability, which the authors suggest is a more accurate and reliable test for assessing reliability measurement. For future research, this should be considered when conducting internal consistency assessments. Additionally, to our knowledge, our study is the first to calculate the SEM.

This study presents limitations, the first one being the translation process. Even though the translation was conducted with the best effort, differences in country and cultural settings might influence subtle linguistic variations or

interpretations of items. Another limitation might be that participants were not asked about their treatment history. If participants had undergone any cognitive or educational therapy prior to the assessment, their responses might have been different.

Overall, Spanish is spoken in over 20 countries and is the fourth most spoken language in the world (124). Therefore, having this translated version of the VPCQ in Spanish provides an additional tool to assess sexual dysfunction cognitions. It could facilitate clinicians and future researchers in finding more effective therapeutic approaches.

4.5. Study V. Graded Motor Imagery is effective in women suffering Genito-Pelvic Pain Penetration Disorder. A randomized controlled trial.

This study aimed to assess the effectiveness of a GMI program on pain intensity and sexual function in women diagnosed with GPPPD. Additionally, as a secondary objective, it analyzed the relationship between the study results and participants' ability to imagine movements, as well as their beliefs and thoughts on vaginal penetration. To the best of our knowledge, this is the first study assessing a comprehensive GMI program in this population of women. Results showed that the GMI program significantly reduced pain intensity but did not produce significant changes in sexual function.

Results from this study align with findings from other studies that have utilized GMI as a treatment approach for various pain conditions, including phantom limb pain (64), complex regional pain syndrome (62), and persistent back pain (125,126). The same duration was used in our study, featuring a three-stage intervention, each stage lasting 2 weeks, resulting in a total of a 6-week intervention period.

The third phase of a GMI program typically involves mirror therapy (18). However, since mirror therapy isn't feasible for the pelvic area, we removed it and continued with gradual exposure therapy, which is the final phase of a GMI program. This adjustment parallels GMI interventions for back pain patients, where mirror therapy is also omitted (125). Gradual exposure alone has been shown to be effective in treating other pelvic floor dysfunctions such as chronic pelvic pain (26) and interstitial cystitis (27). Van Lankveld et at. (127) implemented gradual exposure therapy as part of their intervention for women with vaginismus, similar to the third phase used in our study, which involves a hierarchy of steps increasing in difficulty, starting with digital palpation and progressing to vaginal penetration. Our protocol was developed based on Masters and Johnson's Sensate Focus exercises (66). These exercises are aimed at reducing pain-related fear and anxiety by directing focus towards bodily sensations. By concentrating on tactile sensations, individuals can mitigate potential anxiety that may arise during intercourse and better manage any negative distractions. Through gradual exposure therapy, women are encouraged to confront and effectively manage their emotions,

gradually desensitizing themselves as they progress through increasingly anxiety-provoking exercises (66). Other studies have used sensate focus exercises (8,30) as part of their intervention for treating GPPPD. The efficacy of this approach was demonstrated in our study, were participants significantly reduced pain intensity during intercourse.

Sexual function did not show significant improvements in the GMI intervention group, but participants in the control groups tended towards a non-significant deterioration. This outcome is not unexpected, as a graded motor imagery program primarily targets the desensitization of the central nervous system rather than integrating specific components related to sexual functioning. Supplementing GMI with other therapies such as cognitive-behavioral therapy (CBT) could be beneficial. CBT addresses the psychological aspects through relaxation techniques and education, and previous studies have indicated positive changes in sexual functioning with CBT (21,94,127,128). Since this study represents the first implementation of a GMI program for GPPPD, future research could explore the potential benefits of combining GMI with other therapeutic approaches, such as CBT.

The second and third phases of the GMI program in this study involved explicit imagery and gradual exposure. Although gradual exposure therapy typically targets sexual functioning issues like arousal, orgasm, and satisfaction, it did not yield significant effects in this study. This might be attributed to the relatively brief duration of the implementation phases. In our study, explicit imagery resembled the approach used in research where mindfulness therapy was employed to enhance sexual functioning in women with SIAD (116). Mindfulness-based approaches aim to enhance awareness of bodily sensations through acceptance and non-judgmental thoughts, thereby reducing distractions during sexual activity. Brotto et al. (129) compared mindfulness-based cognitive therapy plus psychoeducation with psychoeducation alone, demonstrating significantly greater improvements in sexual distress and satisfaction among participants receiving mindfulness sessions. Their study involved eight sessions of mindfulness, whereas the second phase of our study comprised six sessions, which were not conducted daily. Mindfulness training enhances the response time to noticing physiological sensations after exposure to

sexual stimuli, but daily practice is typically required to establish habits and replace negative thoughts with self-compassion (116). We need to consider that this study was not solely centered on a mindfulness therapy program, but rather a comprehensive GMI program consisting of three phases. As mentioned earlier, GMI primarily targets the central nervous system and pain intensity.

The second phase of a GMI program involves explicit motor imagery, where patients are exposed to contextual images and are instructed to mentally simulate performing those movements or positions without physically executing them. This process activates cells in the primary motor cortex and neural mechanisms associated with the actual movement (18). Viewing pain-related images have been shown to induce anticipatory pain and anxiety in women with GPPPD. Katie Kelly et al. (14) exposed women with genito-pelvic pain to genital-related images and compared their responses to those of women without pain. They found that women experiencing pain reported higher levels of anxiety and anticipated pain. The authors suggest that gradually exposing women with GPPPD to images depicting potentially painful activities could be beneficial for future research. Building on the premise that viewing still images can elicit high levels of anticipated pain, and drawing on findings from a study that demonstrated reduced pelvic pain and symptoms in interstitial cystitis using auditory-guided imagery (27), our study adapted the explicit motor imagery phase by incorporating audios. Instead of visual images, as recommended by GMI authors, participants were instructed to listen to audios and imagine progressively more challenging activities. Our hypothesis was that this approach would elicit less anxiety in women with GPPPD, who could stop the audios if they felt triggered.

The exposure process was conducted gradually, starting from the least anxiety-provoking activity and progressing to the most challenging, which in this case was imagining sexual intercourse. The goal of this gradual progression was to normalize centrally sensitized changes in the brain, thereby reducing anxiety and fear through desensitization (130), so participants progressed to the more anxiety-provoking activities with less anticipated fear and anxiety.

This program was conducted fully online, increasing accessibility to women who do not have access to a specialized physiotherapist or are reluctant to attend

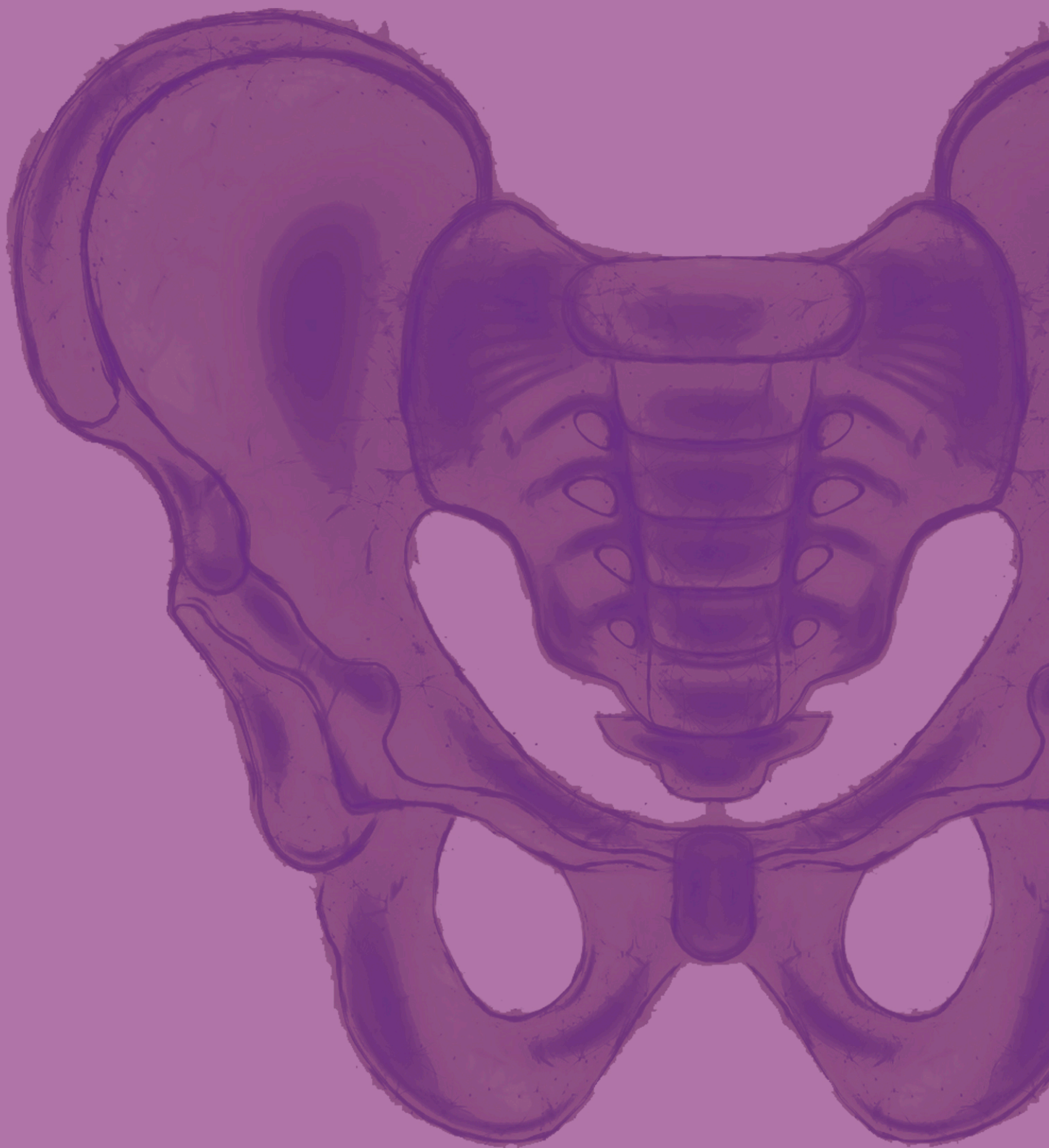
in-person therapy. Many women with penetration disorders do not feel comfortable seeking help for various reasons, such as feelings of shame, seeking help on a taboo subject, or embarrassment (29). Online treatments could also be an option for those women experiencing pain with less severe symptoms, potentially preventing a persistent course of GPPPD.

This is the first study to implement a full graded motor imagery program in women diagnosed with GPPPD. Results show that pain is reduced with a 6-week GMI program. This is a valuable tool not only for physiotherapists but also for gynecologists and psychologists who treat women with GPPPD. Many women experience pain not only during vaginal penetration but also during gynecological examinations or tampon insertion. Therefore, this treatment approach could also have a positive impact on those women potentially reducing their pain intensity.

A limitation of the study is the relatively brief implementation period. Although GMI programs typically last 6 weeks, a more extended gradual exposure period might be necessary to achieve significant changes in sexual function. Another limitation is the lack of a post-intervention follow-up to assess the long-term impact of the results, as seen in other studies that included follow-ups at 6 and 12 months (26,129).

The use of a GMI program has proven to be an effective, reliable, non-invasive method for managing fear and pain in women with GPPPD. It is a low-cost, accessible program with no adverse effects, making it a suitable, economical, and complementary technique for treating women with GPPPD.

Chapter 5.
CONCLUSIONS



5. Conclusions

Study I

- The quality of the videos assessed on YouTube regarding dyspareunia is average according to the evaluation tools. Higher-quality videos are typically produced by academic institutions and have lower view ratios.

Study II

- There is no correlation between the results of a Pain Neuroscience Education program for patients diagnosed with Genito-Pelvic Pain/Penetration Disorder and their socio-economic status or age. Pain Neuroscience Education significantly reduces pain intensity in women diagnosed with Genito-Pelvic Pain/Penetration Disorder, irrespective of their socio-economic status or age.

Study III

- Participants receiving a Pain Neuroscience Education didn't show significant overall improvements in sexual function, as assessed with the Female Sexual Function Index. However, they did show significant improvements in the "Pain" and "Satisfaction" domains of the FSFI.

Study IV

- The Spanish version of the Vaginal Penetration Cognition Questionnaire is a valid, reliable and consistent tool to assess vaginal penetration cognitions in women diagnosed with Genito-Pelvic Pain/Penetration Disorder.

Study V

- A Graded Motor Imagery program is effective in improving significantly pain intensity and non-significantly sexual function in women diagnosed with Genito-Pelvic Pain/Penetration Disorder.

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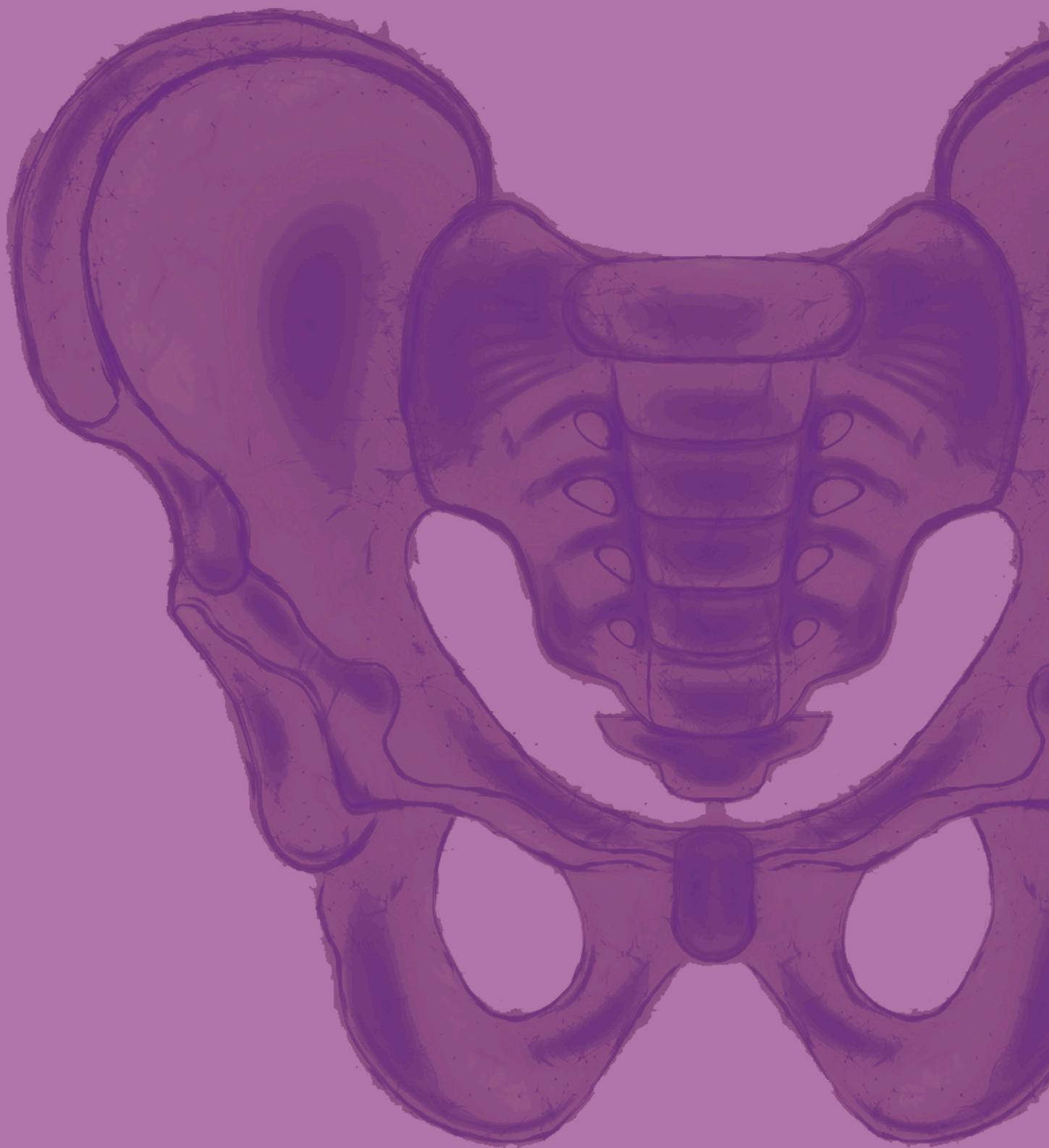

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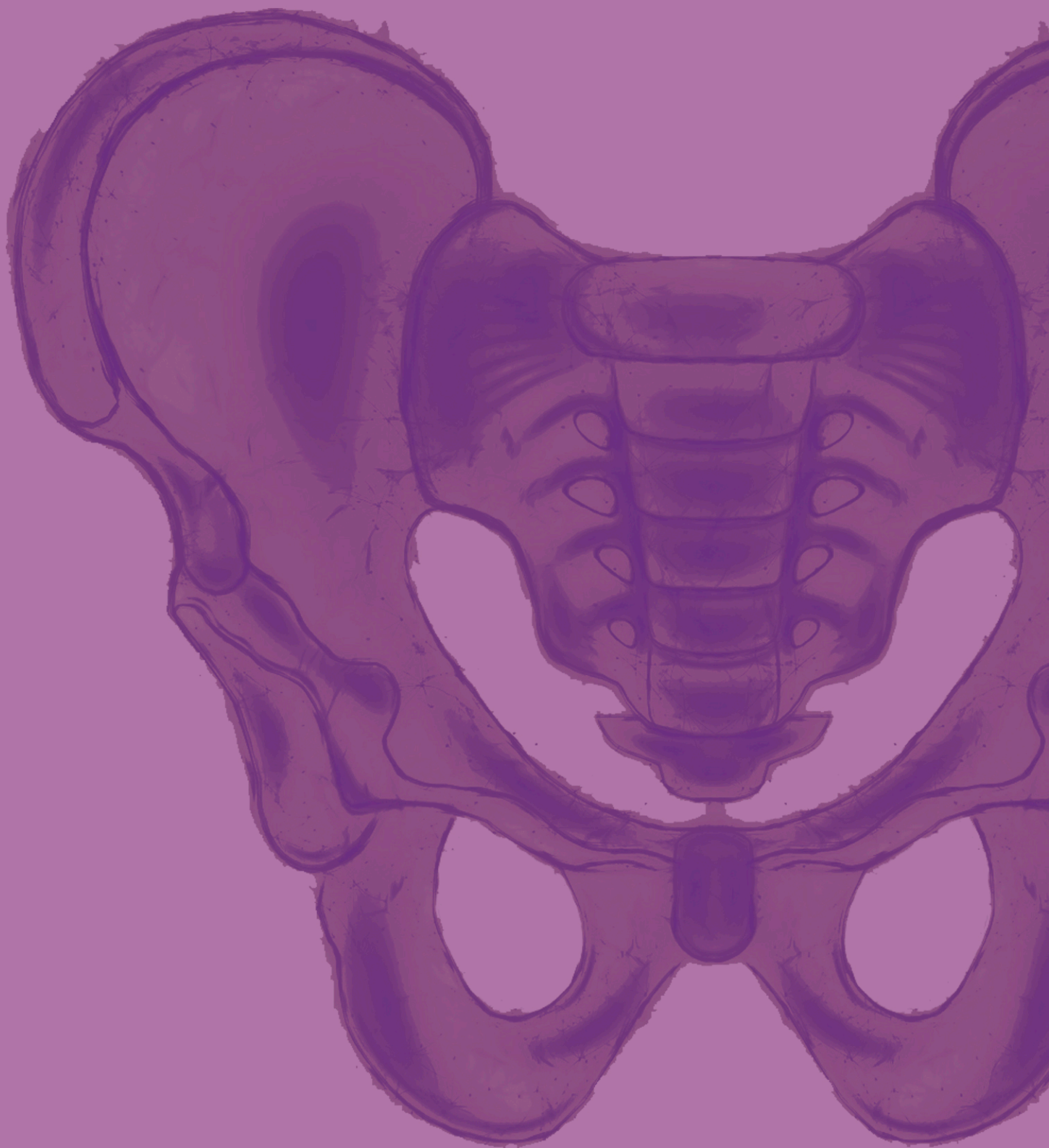
ANNEX



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Educational videos about dyspareunia and the assessment of their quality and reliability: An observational study

Aida Lopez-Brull, Borja Perez-Dominguez, Maria Plaza-Carrasco and Jose Casaña

Abstract

Objective: The aim of this study was to analyze the characteristics, availability, quality and reliability of the information found in educational videos about dyspareunia.

Methods: A systematic search was carried out on YouTube searching for educational videos about dyspareunia. Video quality scores were assessed with the DISCERN instrument, Global Quality Scale (GQS) and QUEST tool. Video popularity was evaluated with the Video Power Index (VPI). Interobserver agreement and statistical correlations of the assessment scores were also carried out.

Results: The first 150 videos that appeared were selected. The mean number of views was 35,513.1 views (SD 71,443.9), the mean video length was 05:39 (SD 04:38), the mean days online was 1,396.3 days (SD 706), the mean view ratio was 29.8 (SD 68.1), the mean Like count was 333 likes (SD 1000.6), the mean Dislike count was 13 dislikes (SD 25.3) and the mean VPI Index was 92.1% (SD 16.4%). The mean values for the DISCERN instrument were for Observer-1 40.9 points (SD 9.9) and for Observer-2 39.3 points (SD 8.5). Mean values for the GQS score were for Observer-1 3.1 points (SD 0.9) and for Observer-2 3.0 points (SD 0.8). Finally, mean values for the QUEST tool were for Observer-1 13.3 points (SD 4.1) and for Observer-2 13.1 points (SD 4.2).

Conclusions: The quality of the videos found on YouTube about dyspareunia, according to DISCERN, GQS, and QUEST scores, are average. Videos with high quality scores were produced by Academic Institutions, despite having lower frequency visit rates.

Keywords

Dyspareunia, education, information quality, internet

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Introduction

Dyspareunia, from the Greek *bed partners not fitting together*,[1] is a sexual disorder defined by the presence of pain or discomfort during sexual intercourse, and its associated with tempted or complete vaginal penetration.[2] Prevalence rates for dyspareunia range from 3% to 43% and vary within different cultures and settings.[1,3] Specific pathological disorders, such as endometriosis, other comorbid conditions, myofascial contributors and central sensitization of the nervous system are common causes of dyspareunia.[4]

The lack of good quality education in women's health disorders could lead to misunderstanding and have both sexual and emotional repercussions.[3] It is a common mistake to accept that sexual intercourse can sometimes be painful, and many women are inclined to continue with coitus, if necessary, with their teeth tightly clenched. Women with dyspareunia therefore develop clinically relevant comorbidities, especially psychological, such as depression, anxiety, and erotophobia.[1,3]

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Poorly understanding dyspareunia relates directly to the available information resources found on the internet. These resources are scarce and often don't follow quality standards. More so, people are inclined to draw upon search engines that don't filter resources based on their content's quality instead of scientific databases with filtered good-quality resources.

Up until December 31st, 2020, around 64.7% of the world's population has had access to the Internet, this accounts for 5,098,463,772 users.[5] From all the different websites, YouTube is the second most accessed, counting with 34.6 billion monthly visits. It is the second trendiest search engine, following Google, and the biggest video archive website.[6]

Therefore, YouTube has become a relevant channel for shared information, especially involving health-related issues. Users refer frequently in order to search for information regarding the definition, diagnosis and treatment of many clinical presentations.[7] Due to this matter, it seems important to consider the authorship, quality and validity of this information, because of its relevancy in patient's education and medical decision taking.[8]

This consideration becomes essential when there is no thorough editorial checking and quality assessment of every uploaded content to the website. Therefore, there is a necessity to be cautious with the information we are accessing, though it may be misleading or inaccurate.[9]

Therefore, the aim of this study was to assess the availability, characteristics and quality of the content found in YouTube relating dyspareunia that is accessible for the general population.

Materials and methods

Recruitment

On February 18th, 2021, a search was conducted in YouTube using the term *Dyspareunia. Dyspareunia* was chosen as the term to perform the research instead of other lay-person terms such as *painful sex* that could potentially present unrelated or scientifically inaccurate content, or other more specific terms such as *Genito-Pelvic Pain/ Penetration Disorder* that could be too specific and would not include relevant videos. A simple search strategy was used, trying to replicate the results any person could obtain that same day. No restrictions were applied by any filters, but as found by default, YouTube was allowed to sort out the videos by relevance according to the algorithm of that specific day. The first given 150 videos were selected.

The Uniform Resource Locator (URLs) of the videos were used for identification during the screening process. Videos were initially screened for duplicates as well as the inclusion and exclusion criteria. Exclusion criteria were videos in a different language from English, that had less than 1000 views, duplicated, unrelated medically to the search term or videos that required age verification for their viewing.

Forty videos were finally screened and assigned to two different researchers that viewed, analyzed and assessed them during a 2-week period (Figure 1).

Based on their production source, videos were classified in either produced by an academic institution, health organization, media or and individual. Video country origin was also registered, and if no country information was given, origin was labeled as *unknown*.

Descriptive statistics of the videos were compiled and organized. "View count," "Likes," "Dislikes," "Days online," "Author," and "Duration" of each video were collected too. In order to assess the popularity of each video, the Video Power Index (VPI) and View Ratio were used.[10] The quality of the videos as an educational source was also assessed using the DISCERN instrument,[11] the Global Quality Scale (GQS)[12-15] (Figure 2) and the Quality Evaluation Scoring Tool (QUEST)[16] (Figure 3).

The DISCERN Questionnaire consists of a total of 16 questions. This instrument was created in 1999 by the Division of Public Health and Primary Care at Oxford University in order to assess the quality of the information given for treatment choices in health problems.[11] The instrument contemplates 15 initial questions involving different quality criteria, and an additional last question rating overall quality. Questions are classified in three different categories (questions 1–8 in reliability, 9–15 in information quality and 16 in overall quality). Questions are rated in a 1–5 scale (1: Very poor, 2: Poor, 3: Average, 4: High and 5: Very High Quality). There is a total of 80 possible points, and the higher the result the better the quality.

The GQS is a scale used to assess the quality of online content. The scale has a grading from 1 to 5 points, being 1 the lowest and 5 the highest educational quality.[12] Each point has a brief description of the quality of content and a qualification is assigned according to this description.

Finally, each video was also assessed using the QUEST tool.[16] QUEST measures six different aspects of the quality of online health information (authorship, attribution, conflict of interest, currency, complementarity, and tone). Attribution is measured through two items, so the tool consists of a total 7 items and a total of 28 points can be yielded. Each of the items is assigned a weighted score, being 28 the highest quality.

Statistical analysis

Descriptive statistics were obtained from each video calculating their mean average and establishing their minimum and maximum values along with their Standard Deviation (SD). The same values were obtained for the quality scales.

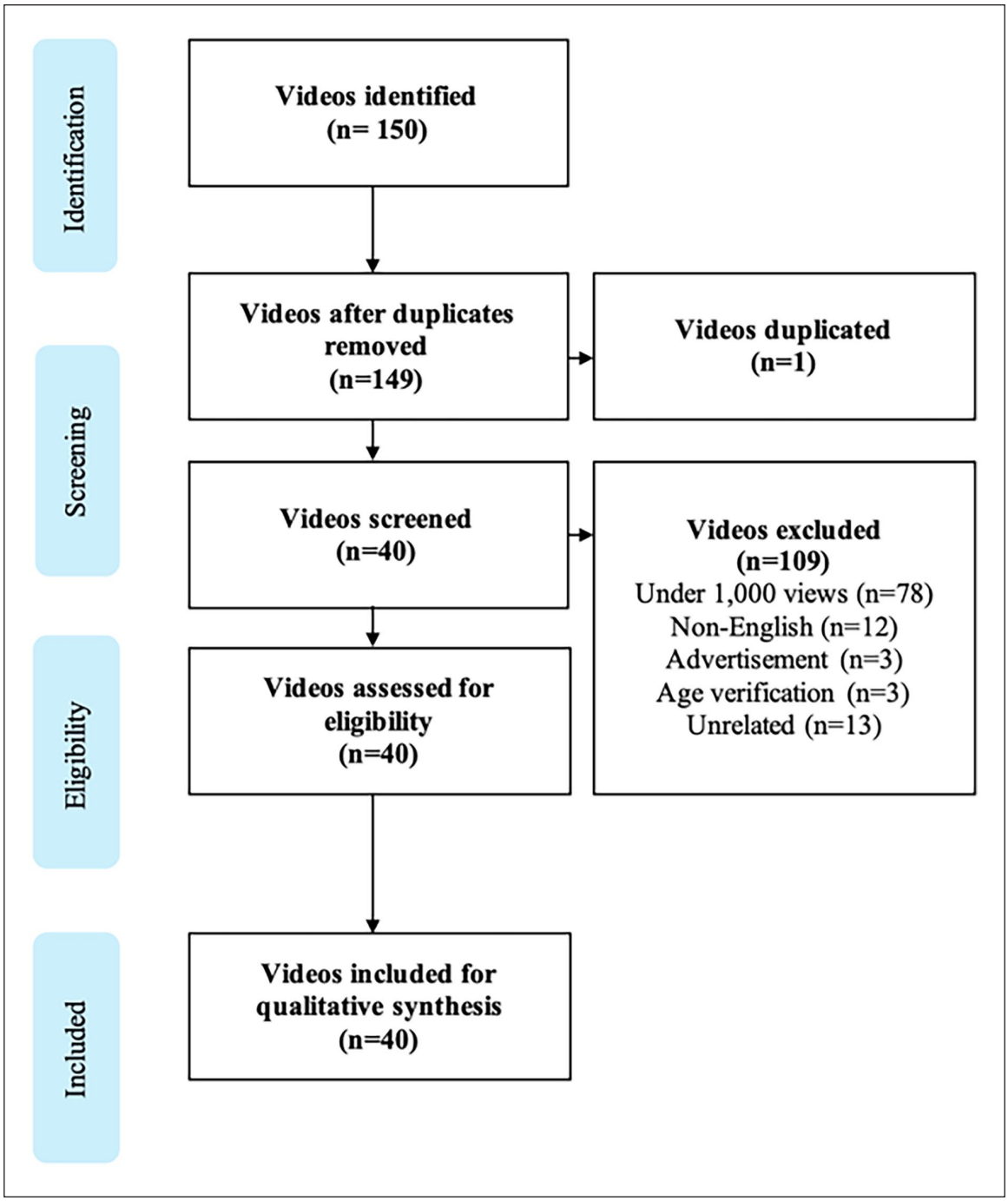

Figure 1. Video flow diagram.

The interrater agreement was determined using the kappa coefficient (κ), using $\kappa > 0.7$ to indicate high level of agreement; $\kappa = 0.5–0.7$ to indicate a moderate level of agreement; and $\kappa < 0.5$ to indicate a low level of agreement.

To determine how consistent repeated measures could be, to assess interrater concordance the Intraclass Correlation Coefficient (ICC) was used. ICC establishes a coefficient that ranges from 0 to 1, being 0 no correlation and 1 the highest correlation possible. Scores ranging from 0 to 0.4 are considered to have low correlation, from 0.4 to 0.6 moderate correlation, 0.6–0.8 average correlation and scores above 0.8 show high correlation. Confidence intervals were established at 95% with a two-way random model, consistency type, and the level of significance was set at $p < 0.05$. Pearson's correlation method was also applied. This coefficient is a measure of the linear correlation between two sets of data, and shows results between

Grading	Description of Quality
1	Poor quality; is unlikely of be to use for patient education.
2	Poor quality; is of limited use to patients because only some information is present.
3	Suboptimal quality and flow; is somewhat useful to patients; important topics are missing, some information is present.
4	Good quality and flow; useful to patients because most important topics are covered.
5	Excellent quality and flow; is highly useful to patients.

Figure 2. Global quality scale.

−1 or 1, and the closest the value is to either of these two values, the higher the correlation.

Results

Video characteristics

Based on their production source, 37.5% of the videos were produced by Health Organizations, 32.5% by Individuals, 15% by Academic Institutions and 15% by Media (Figure 4). Based on their country origin, 67.5% of the videos were produced in the USA, 8% were produced in Australia, 5% were produced in the UK, 5% were produced in Canada, 5% were produced in India, 5% were produced in Nigeria, 3% were produced in Bosnia and 3% were produced in Switzerland (Figure 5).

Descriptive statistics

Descriptive statistics of the videos are shown in Table 1. The mean number of views was 35,513.1 views (Standard Deviation (SD) 71,443.9), the mean video length was 05:39 (SD 04:38), the mean days online was 1,396.3 days (SD 706), the mean view ratio was 29.8 (SD 68.1), the mean Like count was 333 likes (SD 1000.6), the mean Dislike count was 13 dislikes (SD 25.3) and the mean VPI Index was 92.1% (SD 16.4%). The level of agreement between the reviewers in the assessment was high ($\kappa = 0.820$).

Descriptive statistics of the quality scales are shown in Table 2. The mean values for the DISCERN instrument were for Observer-1 40.9 points (SD 9.9) and for Observer-2 39.3 points (SD 8.5). Mean values for the GQS score were for Observer-1 3.1 points (SD 0.9) and for Observer-2 3.0 points (SD 0.8). Finally, mean values for the QUEST tool were for Observer-1 13.3 points (SD 4.1) and for Observer-2 13.1 points (SD 4.2).

Reliability values are shown in Table 3. The DISCERN instrument showed correlation values of 0.837 in the ICC and 0.839 in Pearson's index, the GQS score 0.839 for the ICC and 0.841 for Pearson's index and the QUEST tool values of 0.982 for both the ICC and Pearson's index.

Evaluation outcomes

According to the DISCERN scores, 3% of the videos showed very poor quality, 25% of the videos showed poor quality, 50% of the videos showed average quality, 20% showed high quality, and 2% showed very high quality. GQS scores were like those of the DISCERN instrument.

Regarding the relationship between the quality of the videos, according to DISCERN, and their source of production, videos made by Academic Institutions showed the higher scores (45.1, SD 12.2), followed by Individuals (41.7, SD 8.9), Health Organizations (38.9, SD 8.2), and Media (41.7, SD 8.9). GQS scores show higher quality results in videos produced by Academic Institutions (3.2, SD 1.2) and Health Organizations (3.2, SD 0.8), followed by Individuals (3.0, SD 0.9) and Media (2.5, SD 0.8). Finally, the QUEST tool showed higher results in videos produced by Academic Institutions too (15.6, SD 5.1), followed by Health Organizations (14.0, SD 3.7), Individuals (12.7, SD 3.2), and Media (9.7, SD 4.6). Interestingly, the source of production showing the higher View Ratio was Media (104.6, SD 156.5), followed by Health Organizations (19.2, SD 27.3), Individuals (18.3, SD 24.3), and Academic Institutions (6.5, SD 12.3). Results can be found in Table 4. Mean scores from both observers were used in order to calculate values for DISCERN, GQS, and QUEST tools.

Authorship (Score x 1)

0 – No indication of authorship or username
1 – All other indications of authorship
2 – Author's name and qualification clearly stated

Attribution (Score x 3)

0 – No sources
1 – Mention of expert source, research findings (though with insufficient information to identify the specific studies), links to various sites, advocacy body, or other
2 – Reference to at least one identifiable scientific study, regardless of format (e.g., information in text, reference list)
3 – Reference to mainly identifiable scientific studies, regardless of format (in >50% of claims)

For all articles scoring 2 or 3 on Attribution: (Score x 1)

Type of study
0 – In vitro, animal models, or editorials
1 – All observational work
2 – Meta-analyses, randomized controlled trials, clinical studies

Conflict of interest (Score x 3)

0 – Endorsement or promotion of intervention designed to prevent or treat condition (e.g., supplements, brain training games, foods) within the article
1 – Endorsement or promotion of educational products & services (e.g., books, care home services)
2 – Unbiased information

Currency (Score x 1)

0 – No date present
1 – Article is dated but 5 years or older
2 – Article is dated within the last 5 years

Complementarity (Score x 1)

0 – No support of the patient-physician relationship
1 – Support of the patient-physician relationship

Tone (includes title) (Score x 3)

0 – Fully supported (authors fully and unequivocally support the claims, strong vocabulary such as "cure", "guarantee", and "easy", mostly use of non-conditional verb tenses ("can", "will"), no discussion of limitations)
1 – Mainly supported (authors mainly support their claims but with more cautious vocabulary such as "can reduce your risk" or "may help prevent", no discussion of limitations)
2 – Balanced/cautious support (authors' claims are balanced by caution, includes statements of limitations and/or contrasting findings)

Figure 3. QUEST tool.

Additionally, when analyzing the relationship between the quality of the videos, according to DISCERN, and their country of origin (Table 5), the video produced in Switzerland had the highest quality (48.0, SD 0.0), followed by videos produced in the UK (46.5, SD 6.4), Nigeria (46.3, SD 8.1), Australia (42.3, SD 1.5), a video from Bosnia/Herzegovina (42.0, SD 0.0), videos from Canada (41.0 ± 11.3), USA (38.8, SD 10.1), and India (36.0, SD 2.8). GQS scores also show higher quality results in the video from Switzerland (4.0, SD 0.0), followed by videos from Nigeria (3.8, SD 0.4), Australia (3.3, SD 0.6), the video produced in Bosnia/Herzegovina (3.0, SD 0.0), videos from the USA (3.0, SD 1.0), Canada (3.0, SD 1.4), the UK, and India (2.5, SD 0.7 for both).

Finally, the QUEST tool showed higher results in videos from the UK (17.0, SD 0.0), followed by the video

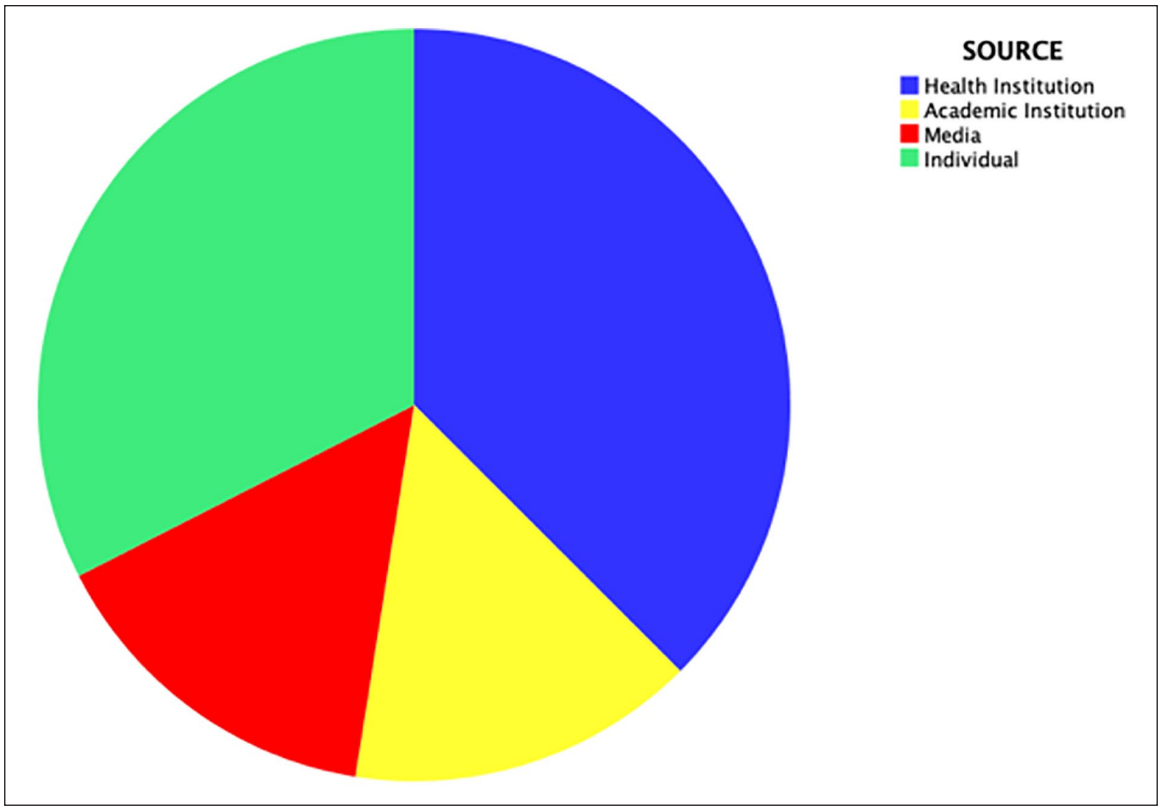

Figure 4. Graphical chart. Videos and source of production.

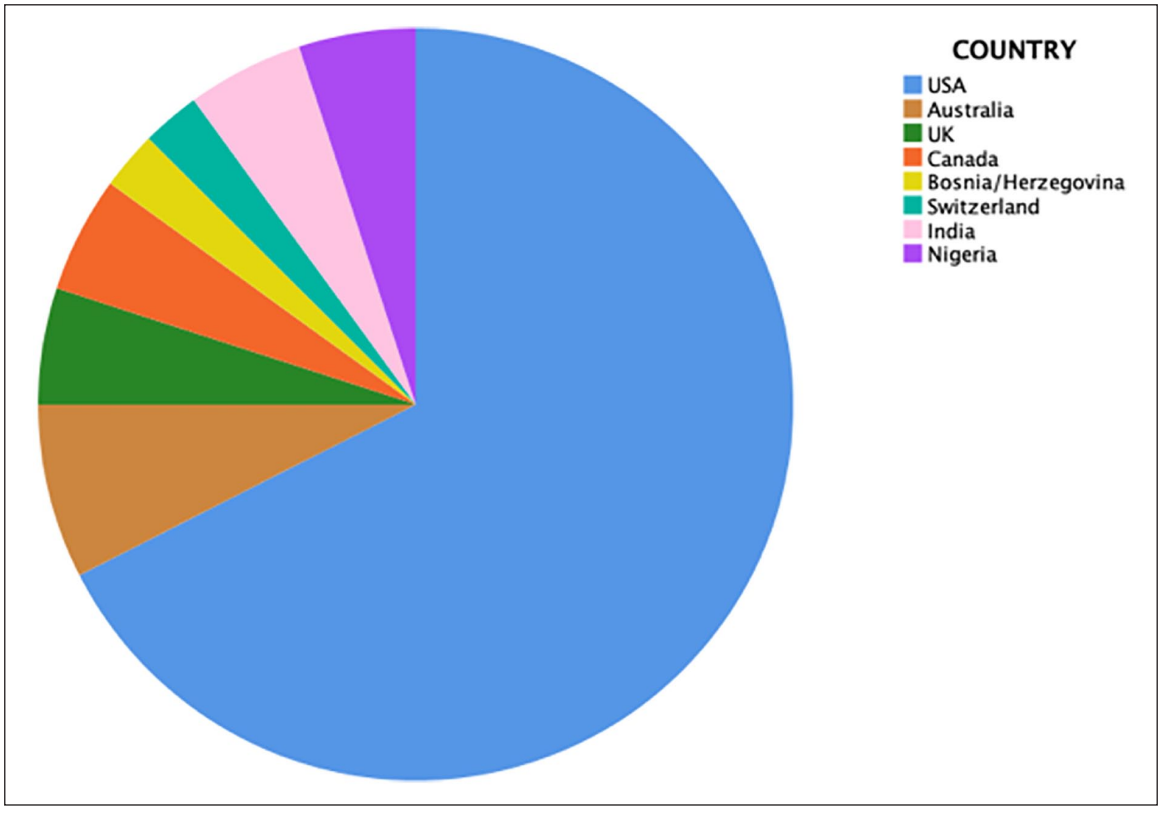

Figure 5. Graphical chart. Videos and country of origin.

Table 1. Descriptive statistics of the videos.

	Min	Max	Mean ± SD
View count	1.116	307.460	35,513.1 ± 71,443.9
Duration (min:s)	00:48	22:28	05:39 ± 04:38
Days online	276	2717	1,396.3 ± 706
View ratio (views/day)	0.5	385.6	29.8 ± 68.1
Likes	0	6077	333 ± 1,000.6
Dislikes	0	113	13 ± 25.3
VPI index (%)	0	100	92.1 ± 16.4

Table 2. Descriptive statistics of the quality scales.

	Min		Max		Mean ± SD	
	Observer 1	Observer 2	Observer 1	Observer 2	Observer 1	Observer 2
DISCERN	25	25	62	61	40.9 ± 9.9	39.3 ± 8.5
GQS	1	1	5	5	3.1 ± 0.9	3.0 ± 0.8
QUEST	5	5	24	24	13.3 ± 4.1	13.1 ± 4.2

Table 3. Reliability values.

	Intraclass correlation coefficient (ICC)	Pearson correlation index	*p*-values
DISCERN	0.837	0.846	<0.001
GQS	0.839	0.841	<0.001
QUEST	0.982	0.982	<0.001

Table 4. Information sources and video quality.

	DISCERN (mean ± SD)	GQS (mean ± SD)	QUEST (mean ± SD)	View ratio (mean ± SD)
Academic institution	45.1 ± 12.2	3.2 ± 1.2	15.6 ± 5.1	6.5 ± 12.3
Health organization	38.9 ± 8.2	3.2 ± 0.8	14.0 ± 3.7	19.2 ± 27.3
Media	34.7 ± 7.5	2.5 ± 0.8	9.7 ± 4.6	104.6 ± 156.5
Individual	41.7 ± 8.9	3.0 ± 0.9	12.7 ± 3.2	18.3 ± 24.3

from Switzerland (15.0, SD 0.0), videos from Canada (14.5, SD 2.1), the video from Bosnia/Herzegovina (14.0, SD 0.0), videos from the USA (13.3, SD 4.6), Australia (13.0, SD 3.0), Nigeria (10.8, SD 1.1), and India (8.5, SD 2.1). Videos showing higher View Ratios were the ones produced in Nigeria (45.0, SD 47.9), followed by the ones produced in Australia (36.1, SD 48.6), USA (33.9, SD 80.6), the video produced in Switzerland (29.6, SD 0.0), videos produced in India (16.3, SD 20.8), Canada (7.0, SD 2.9), the video from Bosnia/Herzegovina (2.4, SD 0.0) and videos produced in the UK (0.9, SD 0.6).

Discussion

The Internet has become a crucial information resource about health matters, both for patients and for professionals. But, along with its obvious benefits due to the exponential growth the Internet is experimenting, there are certain risks that must be taken under account, concerning the lack of inspection a major part of the information is receiving. Consequently, this lack of scrutiny might lead to the transmission of wrong and potentially harmful information. Websites such as YouTube, even though being more commonly accessed, are not peer reviewed, and uploaded materials are not criticized before sharing, as they lack an objective evaluation process.[14] This creates a controversy regarding the reliability of these videos.[10]

When analyzing the sources from where the videos were produced, we found out that 37.5% of the videos were produced by Health Organizations, which was the highest percentage, but despite this these videos weren't the ones that showed better quality results. In contrast, only 15% of the analyzed videos were produced by Academic Institutions, which showed the higher quality scores. This underrepresentation of Academic Institutions as information resources is in concordance with similar

Table 5. Country of origin and video quality.

	DISCERN (mean ± SD)	GQS (mean ± SD)	QUEST (mean ± SD)	View ratio (mean ± SD)
USA	38.8 ± 10.1	3.0 ± 1.0	13.3 ± 4.6	33.9 ± 80.6
Australia	42.3 ± 1.5	3.3 ± 0.6	13.0 ± 3.0	36.1 ± 48.6
UK	46.5 ± 6.4	2.5 ± 0.7	17.0 ± 0.0	0.9 ± 0.6
Canada	41.0 ± 11.3	3.0 ± 1.4	14.5 ± 2.1	7.0 ± 2.9
Bosnia/Herzegovina	42.0 ± 0.0	3.0 ± 0.0	14.0 ± 0.0	2.4 ± 0.0
Switzerland	48.0 ± 0.0	4.0 ± 0.0	15.0 ± 0.0	29.6 ± 0.0
India	36.0 ± 2.8	2.5 ± 0.7	8.5 ± 2.1	16.3 ± 20.8
Nigeria	46.3 ± 8.1	3.8 ± 0.4	10.8 ± 1.1	45.0 ± 47.9

studies,[11] and this reflects the lack of high-quality videos that can be found about dyspareunia, reinforcing the idea of potential misleading and harmful information.

Based on their country of origin, 67.5% of the videos were produced in the USA, but despite this, when analyzing the quality of these videos we found out that videos that were produced in the USA ranked seven-eighths in country origins. Again, we find that the highest percentage is not in accordance with the highest quality. Contrarily, videos produced in countries such as Nigeria showed higher quality scores, which can lead us to think that the country's developmental and economic situation is not directly related to their capacity to produce high-quality videos.

These results must be interpreted with caution, because the higher percentage in quantity of videos might lead to higher heterogeneity levels in quality scores, leading to overall reduced quality levels.

The average length of the analyzed videos was 5:39, being slightly inferior to lengths found in previous studies, that range from 6:17 to 10:35.[11,17,18]

The ICC and Pearson's correlation indexes are widely used to analyze the reliability index between several scores. The inter-reviewer agreement scored reliability values that range from 0.837 to 0.982 in the ICC and 0.846–0.982 in Pearson's index, showing high reliability in every quality assessment tool used, so and Excellent reliability can be considered, according to previous studies.[19]

This study shows the result of the analysis of the content available at one precise moment, February 18th, 2021. This content could change overtime, so further analysis is to be done in order to obtain further conclusions. As well, because the *incognito* mode was not used, videos could've had browsing history and geographical location influence. Another limitation is the election of the search term. *Dyspareunia* was chosen as it is not a too colloquial term such as *painful sex* neither a too specific term such as *Genito-Pelvic Pain/Penetration Disorder*. Even though this term was opted to include as much relevant content as possible and filter unrelated content to the condition of interest, the election of the term by itself might've excluded relevant videos that could've been included in the analysis. Further studies are encouraged to include these terms to broaden the analysis.

Conclusions

YouTube is one of the main accessed platforms found on the Internet. It is the biggest video archive, becoming a simple and attractive source of information when dealing with health issues. It has a tremendous potential to serve as an informative resource when patients and health-care professionals search for information.

People who access YouTube searching for information about Dyspareunia visit with the highest frequency videos produced by Health Institutions, but these videos are not rated as the ones to have the highest quality. Videos with high quality produced by Academic Institutions have low frequency visit rates.

The quality of the videos found about Dyspareunia on YouTube, according to the assessment's tools, is average. There is a need to produce better-quality videos about Dyspareunia. Because Academic Institutions are the ones that show the higher quality ratings, they should be the ones in charge of developing a larger number of videos, improving the quality content.

Future studies should assess the evolution of the development of high-quality videos on YouTube about Dyspareunia in order to improve the awareness the general population has on this condition.

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Ethics approval

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Association Levels Between Results from a Therapeutic Educational Program on Women Suffering from Genito-pelvic Pain Penetration Disorder and Their Socioeconomic Status

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Abstract

Introduction Sexual health is fundamental in an individual's well-being. Genito-pelvic pain/penetration disorder, also known as dyspareunia, is one of the most common sexual disorders, and approaches from physiotherapy include multimodal options, being education, a recent resource often used. Social and economic factors might influence the effectiveness of educational therapies in patients suffering this affliction. The objective of this study was to determine if there is an existing correlation between the participant's socioeconomic status and the results of a therapeutic educational program.

Methods A randomized controlled trial was performed using therapeutic education as intervention in a sample of 69 women suffering from genito-pelvic pain/penetration disorder. Results over time were assessed regarding pain intensity, pain-related outcomes, and sexual functioning. Socioeconomic status measurements were obtained in February 2022, and these included age, educational level, household monthly income, or job rank. A correlation analysis was performed between these outcomes using Pearson's correlation index and Spearman's rho statistic.

Results Results from the correlation analysis show that there is no significant correlation between any of the outcomes found in the results of the intervention and the socioeconomic status measurements.

Conclusion A therapeutic educational program improves pain intensity, pain-related outcomes, and sexual functioning in patients with persistent pelvic pain, independently from their age, educational level, household monthly income, or job rank.

Policy Implications Education is a powerful resource that improves sexuality outcomes despite the patient's socioeconomical status in patients suffering from genito-pelvic pain/penetration disorder.

Keywords Association · Dyspareunia · Education · Pelvic pain · Sexual dysfunctions · Socioeconomic status

Introduction

The World Health Organization (WHO) establishes that sexual health is fundamental for the overall well-being of a person. It sets a biopsychosocial model that enables the access to information about sexuality and the availability to receive a sexual health service and to create a surrounding that promotes sexual health (World Health Organization, 2022). WHO relates the social and economic context of a person to its sexual health, and the potential influence that these factors might have in the development of sexual disorders (Castellanos-Torres et al., 2013).

Genito-pelvic pain penetration disorder (GPPPD), also known as dyspareunia or vulvodynia (with incidence rates of 6.6% in Spain) (Gómez et al., 2019), is one of the most common sexual disorders. It consists of a heterogenous group of disorders that affect the person's capacity to experiment sexual pleasure or to respond sexually, producing a painful response instead (Thomas & Thurston, 2016). Dyspareunia and vulvodynia are often intermixed terms, with vulvodynia not necessarily involving the presence of pain during sexual intercourse. Also, dyspareunia can be classified in either primary or secondary, and based on its location in superficial or deep (Tayyeb & Gupta, 2021). Scientific literature classifies GPPPD in several ways, and its development is associated with a type of altered pain response, known

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as nociplastic pain. This type of pain develops in the absence of harmful stimuli and can associate primary or secondary hyperalgesia and allodynia (Siqueira-Campos et al., 2022). Many therapeutical options have been proposed to approach GPPPD from physiotherapy, such as electrotherapy, myofascial release, and exercise (Fuentes-Márquez et al., 2019; Klotz et al., 2018), and education has been outlined as a cost-effective resource that can potentially be very beneficial for these patients (Brünahl et al., 2018; Champaneria et al., 2012). Out of the available resources than can assess the social and economic factors that might influence the development and processing of GPPPD, one of the most robust determinants of mental and physical health and well-being is the socioeconomic status (SES) questionnaire. It is a self-administered questionnaire that assesses diverse measurements to establish social class or economic levels. Out of the many measurements that can be assessed, the American Psychological Association (APA) suggests education, income, and occupation as the most recommended measurements (American Psychological Association, 2022).

Due to the possible influence that social and economic factors could have over patients suffering from GPPPD treated with an educational approach, it is necessary to establish the levels of association between these outcomes. Therefore, the objective of this study is to assess if there is a correlation between the results obtained from a therapeutic educational program in patients suffering from GPPPD, and their socioeconomic status, assessed with their age, educational level, household monthly income, and job rank.

Methods

Design

This study was a parallel trial that addressed a correlation analysis where we assessed the level of association there is between socioeconomic-related outcomes and the results of a therapeutic educational intervention on women with persistent pelvic pain. The initial intervention was a randomized controlled trial, and results related to the change experienced by these women involving pain intensity, other pain-related outcomes, and sexual functioning. The study followed the ethical principles of the Helsinki declaration, and was approved by the Ethics Committees of University of Valencia (Valencia, Spain), Hospital de La Plana (Castellon, Spain), and Hospital de Sagunto (Valencia, Spain), and the protocol was registered in Clinical Trials (NCT05114473).

Interventions

The intervention consisted of a therapeutical education program composed of four weekly workshops that contained information about pelvic floor anatomy, pain neuroscience, and sexuality. These workshops lasted around 40 min each and were developed and delivered by experienced physiotherapists in treating pelvic floor disorders and not only contained theoretical approaches but also allowed participants to be actively involved by a series of exercises and practical tasks. The content of this therapeutic education program can be accessed in the following link: https://mariaplazacarrasco.com/dolor-relaciones-sexuales/.

Participants were allocated into two different interventional groups or a control group. Participants in the intervention group received the educational program through (1) face-to-face (FG) workshops or (2) online (OG) access to a platform where videos of the educational program were uploaded. Participants in the (3) control group (CG) initially received no intervention but were given access to the educational program once the study concluded.

Participants

Participants were recruited through hospital databases and an online campaign delivered through the research team's social network accounts and the Chartered Society of Physiotherapists of the area. An infographic image was distributed along with a link to a Google Forms survey to register participants that could be possibly included. The research team then screened every registry to determine if the participant was eligible or not for inclusion.

The sample was composed of adult (< 18 years) women suffering from persistent pelvic pain for at least a period of 3 months and no reasonable medical explanation for the presence of pain. If women were diagnosed with a medical condition that logically explained the presence of pain, or if the initial episode of pain began in a period inferior to 3 months, participants were excluded.

Outcomes

Results from the randomized controlled trial involved several pain-related outcomes. Pain intensity was assessed using the Visual Analogue Scale (VAS). The VAS consists of a 10 cm horizontal scale that ranges from 0 to 10, being 0 no pain and 10 the maximum possible pain (Karcioglu et al., 2018). Pain-related outcomes were assessed using both the Pain Catastrophizing Scale (PCS), used to quantify an individual's pain experience, rating from 0 to 52, higher scores meaning worse outcome (Olmedillo-Zafra et al., 2013), and the Survey of Pain Attitudes-Brief (SOPA-B), that consists of 30 items scaled from 0=false to 4=true, with a minimum score of 0 and a maximum score of 120, higher scores meaning better outcomes (Tait & Chibnall, 1997), questionnaires. Finally, sexual functioning was assessed using the Female Sexual Function Index (FSFI),

an inventory designed to assess female sexual function that examines desire, arousal, lubrication, orgasm, satisfaction, and pain, rating from 2 to 36, higher scores meaning better function (Neijenhuijs et al., 2019).

Socioeconomical-related outcomes were assessed with the socioeconomical status (SES) questionnaire (Braveman et al., 2005; Fliesser et al., 2018). This is an adaptative resource that establishes a level or category according to simple questions involving income, occupation, educational level… and other outcomes of interest. In our study, SES was assessed through several questions that classified participants according to their educational level, household monthly income, and job rank, three of the most used outcomes in literature. Participant's age was also registered.

Participant's educational level was established according to the International Standard Classification of Education (ISCED) (UNESCO UIS, 2022) in 9 different levels (levels 0–8, being 0 pre-scholar educational level and 8 doctorate education level), household monthly income was established according to the Spanish National Institute of Statistics (INE) through an annual survey (INE.es, 2022) in 11 different levels (from 0 to more than 5.000€ per month), and job rank was established according to the Spanish Ministry of Labor through its latest collective occupational agreement (BOE.es, 2022) in 6 different levels (from level 1 being a job that requires no degree and level 6 being a job that requires a college-level degree).

Randomization and Blinding

Before allocation, participants were divided by blocks in either living on a different or close location to where the face-to-face program was implemented. Then, randomization was made using a sealed opaque envelope system with a 2:1 ratio in either OG or CG in participants not living close to the study location and either FG or CG in participants living close to the study location. Due to the nature of the intervention, blinding was only possible in the researchers carrying the assessments and the researcher in charge of statistical analysis. Participants and researchers in charge of delivering the programs could not be blinded.

Statistical Analysis

Calculations were performed with the SPSS Statistics software, v.23 for MacOS. Sample size was calculated using the G-Power software, establishing that for an estimate 80% power and an alpha-error of 0.05, overall sample should consist of at least 48 participants; 16 of them contained in each of the established groups. Due to possible dropouts, it was established that the sample must contain at least 60 participants. Normal distribution of data was checked through the Kolmogorov–Smirnov test.

Results over time from the educational program were calculated using ANOVA tests of repeated measures, calculating mean differences and standard deviations for every outcome in every group. These results were used in the association with the SES outcomes through a correlation analysis. SES outcomes and participant's age were associated using Pearson's correlation index, and due to the outcome nature of the rest of the SES outcomes, association of results with educational level, monthly income, and job rank was established through a non-parametric test, Spearman's rho.

Results

Participant flow chart is shown in Fig. 1. Out of the initially recruited participants, inclusion and exclusion criteria were passed through, and a total of 69 participants were finally included. Participants were then randomized to an intervention or a control group. Once the intervention ended, 4 participants were lost to follow-up, all of them due to voluntarily refuse to take post-intervention assessments.

Participant's baseline characteristics and socioeconomic status level frequencies are summarized in Table 1. Participant's mean age was similar in every group. Regarding educational level, all participants had at least a level 4, and most of them ($n = 33$, 48%) had a level 5. With respect to monthly household income, the vast majority, $n = 60$ (87%), of participants were grouped in the middle-levels of income. Finally, involving job rank, participants were more frequently allocated to jobs that required no degree at all ($n = 27$, 39%) or that required a college degree ($n = 19$, 28%).

Results from the ANOVA are summarized in Table 2. Significant improvements ($p < 0.05$) were found both in the face-to-face group and the online group regarding pain intensity, assessed with the VAS, and in pain catastrophizing in the online group, assessed with the PCS. Non-significant improvements were also found in pain catastrophizing in the face-to-face group, pain attitudes for both groups, assessed with the SOPA-B, and sexual functioning, assessed with the FSFI.

Results from the correlation analysis with every outcome assessed with the SES are presented in Tables 3, 4, 5 and 6. Regarding age, there is no significant ($p < 0.05$) interaction between the results obtained and the age of the participants, meaning that participants improved in every outcome independently from their age. Educational level, household monthly income, and job rank showed no interaction too, meaning these outcomes had no relevant influence in the improvement participants experimented.

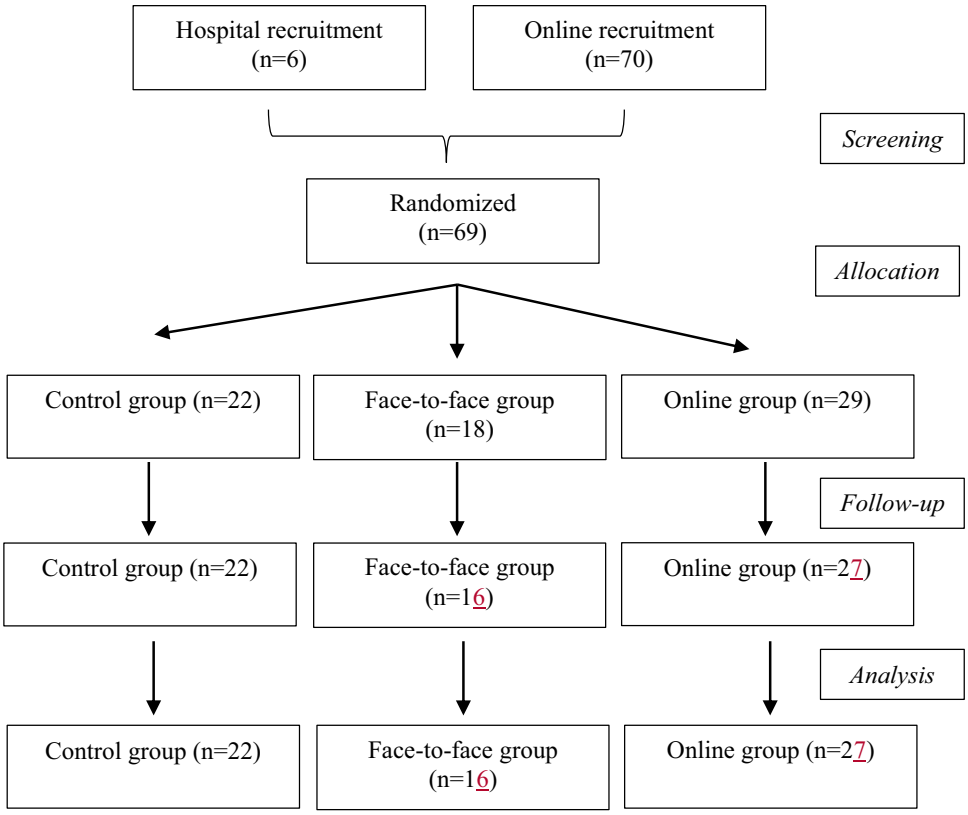

Fig. 1 Participant flow chart

Discussion

This study assessed the correlation levels of the results of a therapeutic educational program in patients suffering from GPPPD and their socioeconomic status. Analyzing the association between these outcomes, no significant correlation levels were observed, meaning that the improvement these patients experimented regarding pain-related and sexual functioning outcomes was independent from their age, educational level, household monthly income, or job rank.

People with a lower socioeconomic status have poorer health outcomes in many diseases, especially diseases with pain-processing dysfunctions such as fibromyalgia (Fitzcharles et al., 2014) or musculoskeletal pain (Macfarlane et al., 2009; Bergman et al., 2001), due to financial issues, access to health interventions, or low adherence rates to medical recommendations. Our study had a relatively young sample (32.8 years) composed of women suffering GPPD. Other studies (Fitzcharles et al., 2014) that did find significant correlation levels did so with older samples or samples composed by women and men, suggesting both age and gender could be relevant.

Every outcome assessed in this study is subjective and depends on the patient's perception of their pain and sexual functioning, so results may not truly reflect the health status of participants. Also, only significant improvements were found in both groups for pain intensity, assessed with VAS, and only in one of the groups for pain catastrophizing, assessed with PCS, the rest of the improvements were non-significant. Possibly, with better results, there could be a significant influence of socioeconomic factors. Adherence rates to the programs could also be relevant. Participants in the online group could access the program anywhere and at any time during the week; therefore, this could have enabled higher adherence rates in this group, explaining the better results.

Authors also chose to use both Pearson's correlation index and Spearman's rho statistic to do the correlation analysis. Other studies used between-group comparisons with a *t*-test (Armour et al., 2020), multiple hierarchical regression analyses (Fliesser et al., 2018), or Poisson regression analysis (Landry & Bergeron, 2009). Since there is no gold standard statistical assessment, in this case, authors decided to replicate statistical analyses performed in similar studies to establish correlation levels, using Pearson's correlation index

Table 1 Participant's baseline characteristics and socioeconomical status category frequencies

	Total	Face-to-face	Online	Control
Age (years) (SD)	32.8 (9.5)	34.5 (13.2)	31.6 (6.9)	33.0 (9.1)
Educational level				
Level 0	0	0	0	0
Level 1	0	0	0	0
Level 2	0	0	0	0
Level 3	0	0	0	0
Level 4	5	0	2	3
Level 5	7	2	4	1
Level 6	33	11	13	9
Level 7	22	4	10	8
Level 8	2	1	0	1
Income level				
0–499€	1	1	0	0
500–999€	1	1	0	0
1.000–1.499€	16	7	3	6
1.500–1.999€	15	3	8	4
2.000–2.499€	10	2	7	1
2.500–2.999€	9	1	3	5
3.000–3.499€	10	2	5	3
3.500–3.999€	1	1	0	0
4.000–4.499€	2	0	1	1
4.500–4.999€	0	0	0	0
> 5.000€	4	0	2	2
Job rank				
Level 1	27	9	8	10
Level 2	1	0	1	0
Level 3	6	3	0	3
Level 4	6	1	4	1
Level 5	19	4	9	6
Level 6	10	1	7	2

Table 2 Results of the ANOVA

Outcome	Group	Mean (SD)	
		POST	PRE
VAS (points) *Mean (SD)*	Face-to-face	5.3 (2.5)	3.8 (2.4)
	Online	5.8 (2.0)	4.9 (2.5)
	Control	5.1 (1.8)	4.9 (2.2)
PCS (points) *Mean (SD)*	Face-to-face	25.2 (12.7)	18.9 (12.6)
	Online	28.0 (10.4)	20.4 (11.5)
	Control	22.4 (7.5)	25.3 (8.2)
SOPA-B (points) *Mean (SD)*	Face-to-face	45.1 (10.6)	45.2 (14.5)
	Online	49.6 (13.1)	50.9 (14.8)
	Control	52.4 (13.0)	52.4 (13.6)
FSFI (points) *Mean (SD)*	Face-to-face	18.9 (7.8)	21.0 (9.5)
	Online	19.1 (7.3)	20.8 (8.1)
	Control	19.5 (7.1)	18.4 (9.3)

to correlate continuous variables (results and age) (Landry & Bergeron, 2009) and Spearman's statistic to establish correlation between continuous (results) and categorical (educational level, household income and job rank) variables (Armour et al., 2020).

Our study has limitations. First, out of the multiple options that could be chosen to assess SES, we only chose three major measurements. Household income and job rank are factors that do not influence health outcomes equally during the whole life of a patient, so these must be understood within the sample we are analyzing, which is relatively young. However, the level of education has been validated as a reliable, accurate, and consistent measurement of SES (Liberatos et al., 1988; Shavers et al., 2007), chosen as the best predictor of good health (Wnkleby et al., 1992; Braveman et al., 2005), and it is to be understood as a factor that does not generally change overtime.

Also, for every measurement, we established levels according to specific guidelines that adhere to the author's country, and these levels might change according to the educational program, economy, and job classification of different countries. Despite this, authors tried to choose classification systems with many categories in every measurement, assuring as many social gradients applied to the social spectrum as possible (Braveman et al., 2005).

Social Policy Implications

The aim of this study was to assess if the socioeconomic status of a patient influenced the results of a therapeutic educational program when treating Genito-Pelvic Pain/Penetration Disorder. Results show that despite their socioeconomic status, patients improved in several outcomes involving their sexual health, meaning that education is a powerful cost-effective weapon that can be used in every patient suffering from this affliction (Armour et al., 2020; Landry & Bergeron, 2009).

Table 3 Results from the correlation analysis regarding age

Outcome	Face-to-face		Online		Control	
	Pearson's correlation index	*p*-value	Pearson's correlation index	*p*-value	Pearson's correlation index	*p*-value
VAS	0.384	0.071	−0.157	0.217	0.190	0.199
PCS	0.384	0.071	−0.157	0.217	0.190	0.199
SOPA-B	−0.366	0.081	0.287	0.073	0.543	0.005
FSFI	−0.212	0.216	−0.313	0.056	0.137	0.271

Table 4 Results from the correlation analysis regarding educational level

Outcome	Face-to-face		Online		Control	
	Spearman's rho	*p*-value	Spearman's rho	*p*-value	Spearman's rho	*p*-value
VAS	−0.044	0.871	−0.082	0.685	−0.102	0.651
PCS	−0.044	0.871	−0.082	0.685	−0.102	0.651
SOPA-B	−0.109	0.688	−0.228	0.252	−0.065	0.773
FSFI	0.061	0.823	−0.098	0.625	0.200	0.372

Table 5 Results from the correlation analysis regarding household monthly income

Outcome	Face-to-face		Online		Control	
	Spearman's rho	*p*-value	Spearman's rho	*p*-value	Spearman's rho	*p*-value
VAS	−0.145	0.593	−0.035	0.863	0.020	0.928
PCS	−0.145	0.593	−0.035	0.863	0.020	0.928
SOPA-B	−0.080	0.768	0.222	0.265	−0.123	0.586
FSFI	0.127	0.638	0.000	0.999	0.118	0.600

Table 6 Results from the correlation analysis regarding job rank

	Face-to-face		Online		Control	
Outcome	Spearman's rho	*p*-value	Spearman's rho	*p*-value	Spearman's rho	*p*-value
VAS	0.117	0.666	0.089	0.658	−0.063	0.780
PCS	0.117	0.666	0.089	0.658	−0.063	0.780
SOPA-B	−0.153	0.572	−0.132	0.512	0.015	0.948
FSFI	−0.383	0.143	0.008	0.970	−0.050	0.825

Conclusion

Results from this research suggest that a therapeutic educational program improves pain intensity, pain-related outcomes, and sexual functioning in patients with persistent pelvic pain, independently from their age, educational level, household monthly income, or job rank.

Author Contribution All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by Aida Lopez-Brull, Lola Canton-Vitoria and Maria Plaza-Carrasco. The first draft of the manuscript was written by Borja Perez-Dominguez, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Data Availability The data that support this study cannot be publicly shared due to ethical or privacy reasons and may be shared upon reasonable request to the corresponding author if appropriate.

Code Availability Not applicable.

Declarations

Ethics Approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Univer-

sity of Valencia; Hospital de Sagunto and Hospital La Plana Ethics Committee(s) approved this study.

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Consent for Publication The authors affirm that human research participants provided informed consent for publication of the images in Fig. 1.

Conflict of Interest The authors declare no competing interests.

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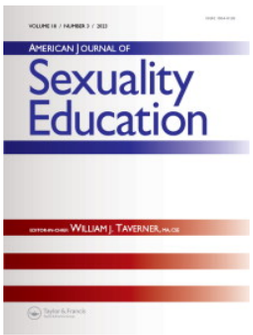

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Assessing Sexual Functioning with the Female Sexual Function Index in Women Suffering from Genito-Pelvic Pain Penetration Disorder Undergoing a Therapeutic Educational Program

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ABSTRACT

Genito-Pelvic Pain/Penetration Disorder is a common sexual disorder that affects an individual's sexual health and overall well-being. Education is a therapeutic resource that presents several advantages, and it can potentially generate improvements both in pain and sexual functioning-related outcomes in patients suffering from this affliction. The objective of this study was to assess if a therapeutic educational program produced improvements in the different domains of the Female Sexual Function Index in participants suffering from Genito-Pelvic Pain Penetration Disorder. Participants were randomized into a group that received a face-to-face therapeutic educational program, a group that received the same program but online, or a control group. The Female Sexual Function Index was assessed, and analysis of the change in the domains for every group was performed using multiple t-tests. Improvements were found in the face-to-face intervention group, but only the "Pain" domain showed significant improvements (-1.1 points, $p < 0.05$). Improvements were also found in the online group, but they were only significant in the "Pain" and "Satisfaction" domains (-0.8 points, $p < 0.05$ for both). A therapeutic educational program improves pain-related outcomes, and it shows a positive tendency to also improve sexual functioning-related outcomes in patients suffering from Genito-Pelvic Pain/Penetration Disorder. Registration: Clinical Trials (NCT05114473).

LAY SUMMARY

Therapeutic education interventions are effective when treating pain associated with sexual activity, and show positive results involving other aspects of sexuality.

KEYWORDS

Dyspareunia; education; pelvic pain; sex education; sexual dysfunctions, physiological; sexual dysfunctions, psychological

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Registration: Clinical Trials NCT05114473

1. Introduction

Genito-Pelvic Pain Penetration Disorder (GPPPD) is a term that contains commonly known afflictions such as "dyspareunia," "vulvodynia," and "vaginism," is one of the most common sexual disorders (Thomas & Thurston, 2016) that directly affects individual's sexual health and overall well-being. It is a heterogeneous group of disorders that affect the sexual experience and lead to a development of a painful output, and this development is associated with a type of altered pain response, known as nociplastic pain, that develops in the absence of a painful of dangerous stimuli (Siqueira-Campos, 2022).

The management of this condition is multidisciplinary, as many factors might influence its etiology. Physiotherapy is essential in this condition's treatment, and there are varied options available (Fuentes-Márquez et al., 2019; Klotz et al., 2019), but hands-off therapies, such as therapeutic educational interventions, are a novel and potentially beneficial resource (Brünahl et al., 2018; Champaneria et al., 2012). The biopsychosocial nature of GPPPD outlines that not only biological factors might have an influence in the development of the condition, so alternative therapies that deal with non-biological factors should be given consideration. These therapies could potentially be cost-effective, even delivered telematically, which is proven to be very useful currently. Patients benefit from professional assistance without the need to physically attend to the therapeutic sessions, obtaining beneficial improvements in their condition.

Assessment of GPPPD is complex, and methods to do so range from tedious and exhaustive tools to simple standardized questionnaires (Chedraui & Pérez-López, 2015). Out of the possible sexual functioning assessment questionnaires that are currently used in academic research (Kamińska et al., 2019), the Female Sexual Function Index (FSFI) has been used for over 20 years all around the world, even being validated in several languages (Dall'Agno et al., 2019; Vallejo-Medina et al., 2018). It comprises a series of questions that focus on sexual desire, arousal, lubrication, orgasm, satisfaction, and pain (Gunst et al., 2017), trying to include all possible issues that could affect a person's sexual health overall. The FSFI is therefore a very complete assessment method tool that assesses most of the domains that could be directly related to sexual functioning impairment in women suffering from GPPPD.

We hypothesize that therapeutic education could have a potential role in the management of sexual functioning in women with GPPPD, or at least be influential in some aspects of that sexual functioning. Therefore, the objective of this study is to assess if the implementation of several therapeutic educational programs can produce improvements in the different domains of the FSFI in women suffering from GPPPD.

2. Methods

2.1. Design

This study was a randomized controlled trial, with parallel intervention groups that received a therapeutic educational program either (1) face-to-face or (2) online, and a (3) control group that received no intervention. Participants were recruited from December 2021 to January 2022 through several sources. Social network accounts from the research team and the Official Chartered Society of Physiotherapists of Valencia were used to deliver information about the study, and a link to an online form was provided for participants to complete to be assessed for eligibility. Hospital databases in *Hospital La Plana* and *Hospital Sagunto*, both in Valencia (Spain), were also accessed after being granted permission by the corresponding Ethics Committees, to retrieve potential candidates to be included in the sample of the study. Two members of the research team (C.B.O, and M.M.B) screened the registered answers the online form provided and tabulated in a spreadsheet included participants based on eligibility criteria. The study followed the ethical principles of the Helsinki declaration, research was undertaken with appropriate informed consent of participants, the study was approved by the Ethics Committees of *University of Valencia*, *Hospital La Plana* (Castellon, Spain) and *Hospital Sagunto* (Valencia, Spain), and the protocol was registered in Clinical Trials (NCT05114473).

2.2. Participants

The sample was composed of adult (>18 years) women suffering from Genito-Pelvic Pain Penetration Disorder for at least a period of 3 months and no reasonable medical explanation for the presence of pain. Participants were excluded from this study if they were underaged (<18 years), had no pain, or suffered a medical condition that explained reasonably the presence of pain.

2.3. Intervention

The intervention consisted of a therapeutic educational program developed by expert physiotherapists in treating pelvic floor disorders. The program included 4 workshops that were composed of anatomy, pain neuroscience and sexual education content, and those workshops were either delivered face-to-face or online. Both delivery methods included theoretical content, that was given to the participants by members of the research team in the Face-to-face group or through a previously recorded video in the Online group, and by learning tasks that all participants should complete at home. Prior to the start of the following workshop, participants in the Face-to-

face group were asked if they had completed the exercises by the research team, and an email was sent to participants in the Online group inquiring if any issues have had come up with the practical exercises.

1. Face-to-face workshops were delivered in weekly sessions at the Faculty of Physiotherapy of the University of Valencia by three expert physiotherapists. The content of this program included information involving anatomy of the pelvic floor, sexuality issues and pain management. Sessions included theoretical explanations and participants were given exercises to do at home too. Theoretical content given at these workshops was the same as the Online group, and it can be accessed online in the link provided in the following paragraph. Practical exercises participants were asked to do included drawing what they believed their genitalia looked like, marking in a body map scheme the different areas they found to be erogenous and areas they disliked being stimulated at, using a mirror to explore visually their genitalia, and complete this self-exploration by following instructions provided by the research team through a recording.
2. Online workshops were previously recorded, and were then uploaded to an online platform, from where weekly emails were sent to participants in this group with links to access the videos. Videos can be accessed publicly at https://mariaplazacarrasco.com/dolor-relaciones-sexuales/. Theoretical content of these videos and practical exercises participants in this group were asked to complete were the same as those provided in the Face-to-face group.

Finally, participants in the (3) control group initially didn't receive an intervention, but once post-interventional assessments concluded, were given access to the online content.

2.4. Outcomes

Sexual functioning was assessed through the Female Sexual Function Index (FSFI). The FSFI is a multidimensional instrument that is adapted to assess the current definition of sexual dysfunction and can define the specific complaint of the patient (Jones, 2002). It is a reliable tool that has been previously validated (Kalmbach et al., 2015), and even translated in languages such as Portuguese (Dall'Agno et al., 2019) or Spanish (Vallejo-Medina et al., 2018).

The FSFI comprises six different domains: (1) desire, (2) arousal, (3) lubrication, (4) orgasm, (5) satisfaction and (6) pain. There are a total of 19 items that have 5 or 6 possible answers, and depending on the answer,

scores can range from 2–36 points overall, the higher the scoring meaning the better the functioning. Items 1–2 are associated with the desire domain, items 3–6 with the arousal domain, items 7–10 with the lubrication domain, items 11–13 with the orgasm domain, items 14–16 with the satisfaction domain, and finally items 17–19 are associated with the pain domain (Tayyeb & Gupta, 2022). In order to obtain the scoring for each domain, every item score corresponding to a domain must be summed up and then multiplied by a correcting factor. Overall scoring in the FSFI is obtained by adding the corrected scores of every domain. Scores that are less than or equal to 26 points indicate sexual dysfunction (Rosen et al., 2000). A summary on how to use the FSFI is found in Table 1.

2.5. Randomization

Prior to randomization, participants were classified in subgroups, either if they lived in a location close to the face-to-face intervention or on a long-distance location. This was done to assure the best adherence levels to each of the intervention programs, avoiding participant's inability to attend to the face-to-face program due to location matters, such as living on a different country.

Then, block randomization was made for every subgroup using a sealed opaque envelope system with a 2:1 ratio. Participants living close to the face-to-face intervention location were then randomized either to the face-to-face or control group, and participants living on a long-distance location to the face-to-face intervention were randomized to either the online or the control group.

2.6. Statistical Analysis

Statistical analyses were performed with the SPSS software, in its 23.0 version for MacOS. Sample size calculations were conducted using G-Power software, establishing that for an estimate 80% power and an alpha-error of 0.05, the sample should consist of at least 48 participants, and a minimum of 16 should be included in every group.

Table 1. Summary of how to calculate the Female sexual Function Index score.

Domain	Items	Range of answers	Correcting factor	Min score	Max. score
Desire	1,2	1–5	0.6	2	6
Arousal	3,4,5,6	0–5	0.3	0	6
Lubrication	7,8,9,10	0–5	0.3	0	6
Orgasm	11,12,13	0–5	0.4	0	6
Satisfaction	14,15,16	0–5 or 1 – 5	0.4	0	6
Pain	17,18,19	0–5	0.4	0	6
Overall				2	36

Descriptive statistics of the sample were utilized to analyze the demographic representation and generate the FSFI mean scores of the participants. Results are presented as mean and standard deviation. To compare the mean scores between the different groups, independent t-tests were used. Statistical significance was established at $p < 0.05$.

3. Results

Results from participant flow are summarized in Figure 1. A total of 69 participants were finally included. Participants were then randomized either to a face-to-face intervention group, an online intervention group, or a control group. 18 participants were included in the face-to-face group, 29 were included in the online group and 22 were included in the control group. 4 participants were lost to follow-up due to refusal to undertake post-intervention assessments, so 65 participants were finally included for analysis.

Participant's mean age was 32.8 (SD 9.5) years overall; 34.5 (SD 13.2) years for the face-to-face group, 31.6 (SD 6.9) years for the online group, and 33.0 (SD 9.1) years for the control group. Every participant was

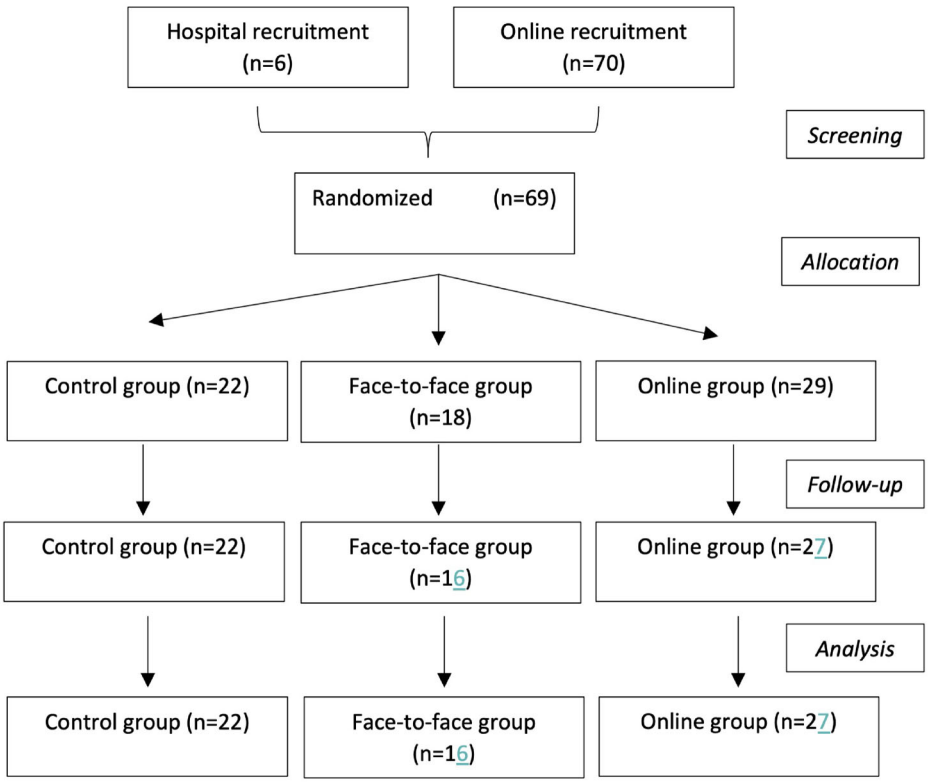

Figure 1. Participant flow chart.

Caucasian, at least had a compulsory secondary educational level (up to 16 years old in Spain), and total household income ranged from 0 to over 5,000€per month. Results from the t-test for every domain in every group are presented in Table 2. Regarding to the face-to-face group, the therapeutic educational program produced an improvement in the "Desire" (−0.3 points, SD 1.1), "Arousal" (−0.3 points, SD 1.1), "Lubrication" (−0.6 points, SD 1.8), "Orgasm" (−0.3 points, SD 1.8), and "Satisfaction" (−0.7 points, SD 1.3) domains, yet only a significant improvement was observed in the "Pain" domain (−1.1 points, SD 1.8, $p < 0.05$). Respective to the online interventional group, improvements were found in "Desire" (−0.4 points, SD 1.2), "Lubrication" (−0.2 points, SD 1.5), "Orgasm" (−0.2 points, SD 2.1), "Satisfaction" (−0.8 points, SD 1.8), and "Pain" (−0.8 points, SD 1.7), being these changes significant in the "Satisfaction" and "Pain" domains ($p < 0.05$). Yet, an improvement couldn't be found in the "Arousal" domain (0.3 points, SD 1.8). Finally, respective to the control group, only the "Desire" domain showed a slight improvement (−0.2 points, SD 0.7), but this improvement was not significant.

4. Discussion

This study assessed the effects over sexual functioning of a therapeutic educational program in patients suffering from Genito-Pelvic Pain Penetration Disorder, finding significant and non-significant improvements in a face-to-face delivery method, and improvements in almost every domain in an online delivery method. This implies that, an educational program either

Table 2. Results of the t-test in every group for every domain.

Group	Domain	Mean Score (PRE)	Mean Score (POST)	MD (SD)	95% CI Min	95% CI Max	*p* Value
Face to Face	Desire	2.85	3.15	−0.3 (1.1)	−0.9	0.3	0.309
	Arousal	2.85	3.13	−0.3 (1.1)	−1.1	0.5	0.473
	Lubrication	2.94	3.58	−0.6 (1.8)	−1.6	0.3	0.183
	Orgasm	3.35	3.60	−0.3 (1.8)	−1.2	0.7	0.587
	Satisfaction	3.93	4.56	−0.7 (1.3)	−1.3	0	0.053
	Pain	2.98	4.04	−1.1 (1.8)	−2.0	−0.1	< 0.05
Online	Desire	2.69	3.13	−0.4 (1.2)	−0.9	0	0.074
	Arousal	3.43	3.17	0.3 (1.8)	−0.5	1.0	0.466
	Lubrication	3.14	3.36	−0.2 (1.5)	−0.8	0.4	0.466
	Orgasm	3.93	4.11	−0.2 (2.1)	−1.0	0.7	0.654
	Satisfaction	3.48	4.24	−0.8 (1.8)	−1.5	−0.1	< 0.05
	Pain	2.67	3.44	−0.8 (1.7)	−1.5	−0.1	< 0.05
Control	Desire	2.76	3.03	−0.2 (0.7)	−0.6	0.1	0.162
	Arousal	3.18	3.00	0.3 (1.3)	−0.3	0.9	0.287
	Lubrication	3.42	3.45	0.1 (1.3)	−0.5	0.7	0.755
	Orgasm	3.32	3.11	0.3 (1.5)	−0.4	1.0	0.372
	Satisfaction	4.22	4.00	0.4 (1.1)	−0.1	0.9	0.124
	Pain	3.34	3.40	0 (1.1)	−0.5	0.5	0.872

CI: Confidence Intervals; MD: Mean Difference; Min: Minimum; Max: Maximum; SD: Standard Deviation. (Level of significance $p < 0.05$).

delivered face-to-face or online creates a potential improvement in sexual functioning in women suffering GPPPD, so advantages and disadvantages of both modalities can be considered to decide which one is a better fit for each patient.

The online intervention group presented more improvements than the face-to-face group, and this could be related to the advantages that online interventions present. Since the development of a world pandemic due to COVID-19, online interventions have gained praise in medical attendance, exercise routines and communication matters. Being able to access the online content whenever they want and wherever they want could have made this type of intervention more feasible for participants, allowing them to effectively complete the program.

This analysis was conducted due to the nature of the content of the educational program, that not only included information regarding pain-neuroscience, but also information about sexuality, and the different domains that are assessed in the FSFI, that not only contemplates pain, but also assess sexual functioning-related issues. Other studies have also contemplated the analysis of each domain of the FSFI, but Gunst et al. (Gunst et al., 2017) did so in a sample of Finnish women with no sexual disorder and Hevesi et al. (Hevesi et al., 2017) in a sample of women that were university students, patients with endometriosis or polycystic ovary syndrome.

The development of an effective educational program would be very beneficial to day-to-day care of patients suffering from sexual disorders such as Genito-Pelvic Pain Penetration Disorder. Often, health care professionals find themselves with very few effective resources to approach this condition (Loving et al., 2012), and having these interventions that require no investment or logistical complications could significantly improve their management of these patients. Other therapies have been proposed, such as trigger point therapy, biofeedback, massage, and exercise (Klotz et al., 2019), but the evidence for these therapies is scarce and they only focus on pain-related symptoms.

Non-significant improvements were found regarding sexual functioning domains. This might be due to the timing of the educational program. The program lasted 4 weeks, meaning that to achieve significant changes in these domains a longer program could be needed. Also, even though the program's content included sexuality, this part was developed by physiotherapists, and other multidisciplinary approaches could've been considered, as sexuality can also be dealt from psychological or medical fields.

Our study presented limitations. With respect to the randomization process, a selection bias might have been incurred when classifying participants either to be close to the location of the face-to-face intervention or not. This was done to assure that participants in the face-to-face intervention

were physically able to attend to the sessions, and it could not reflect the reality of the implementation of educational programs, were the fact of physically attending the sessions could limit the patients access to this type of intervention. Despite this, both face-to-face and online interventions produced similar results, meaning that taking under consideration the above-mentioned disadvantage, it is reasonable to recommend online interventions as an effective approach. Also, we could've conducted a more robust statistical analysis, such as an ANOVA, that would've enabled comparison between groups, so the statistical analysis chosen might've been underpowered.

Also, independent variables that potentially might have influenced the interpretation of the results should've been considered, such as the participants educational level or previous knowledge about the content of the therapeutic educational program.

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Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article and/or its supplementary materials.

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Article

Psychometric Properties of the Translated Spanish Version of the Vaginal Penetration Cognition Questionnaire: A Preliminary Work for Validation

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Abstract: (1) Background: To develop an instrument in Spanish to assess beliefs and feelings about vaginal penetration and assess its psychometric properties. (2) Methods: This study translated and adapted the Vaginal Penetration Cognition Questionnaire into Spanish, and a total of 225 women who suffered from Genito-Pelvic Pain/Penetration Disorder were included in the study. The psychometric properties, including construct, convergent and discriminant validity, test–retest reliability, and internal consistency of the translated version were assessed. (3) Results: The Spanish version of the Vaginal Penetration Cognition Questionnaire is a valid, reliable, and consistent tool to assess beliefs and thoughts about vaginal penetration in women suffering from Genito-Pelvic Pain/Penetration Disorder. The exploratory factor analysis yielded four domains that explained 62.5% of the variance. Convergent and discriminant validity was also confirmed. Test–retest reliability was high, with an intraclass correlation coefficient value of 0.90, a standard error of measurement of 4.21, and a minimal detectable change of 11.66 points. Every domain also showed good internal consistency levels, with Cronbach's α values ranging from 0.84 to 0.89. (4) Conclusion: The Spanish version of the Vaginal Penetration Cognition Questionnaire is a valid, reliable, and consistent tool to assess vaginal penetration cognition in women suffering from Genito-Pelvic Pain/Penetration Disorder.

Keywords: psychometrics; reliability; Spain; translation; Vaginal Penetration Cognition Questionnaire; validity

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1. Introduction

Pain during intercourse is a common female sexual dysfunction, classically diagnosed either as "vaginismus", "vulvodynia", or "dyspareunia" [1]. The American Diagnostic and Statistical Manual of Mental Disorders, in its 5th edition (DSM-V) integrates vaginismus, vulvodynia, and dyspareunia under a unified term, Genito-Pelvic Pain/Penetration Disorder (GPPPD) [2], a multifactorial condition influenced by biological, psychological, and social factors that generates persistent pelvic pain during sexual intercourse or anticipated vaginal penetration.

Women with GPPPD often have negative beliefs about pain and sexuality, and these may result in avoidance of sexual intercourse and anticipatory anxiety, which ultimately leads to partner avoidance [3]. Beliefs and cognitions about vaginal penetration have also been proposed to play a relevant role in the aetiology, exploratory models, and treatment of

sexual pain disorders [4]. For instance, catastrophic pain thoughts, such as "this pain will be unbearable", subsequently generate a response in the body that increases pelvic muscle tone or vaginal dryness, enhancing the difficulty for penetration.

Despite the potential relevance of beliefs about vaginal penetration in the assessment and treatment of GPPPD, the availability of developed and validated instruments to assess this construct is limited. Usually, the assessment of this construct is contained within instruments that assess several dimensions along with beliefs about vaginal penetration. For instance, instruments such as the Multidimensional Vaginal Penetration Disorder Questionnaire (MVPDQ) [5] and its partner version, Partner Version of the Multidimensional Vaginal Penetration Disorder Questionnaire (PV-MVPDQ) [6], include items involving attitudes and beliefs about vaginal penetration, but they do not assess these per se and are considered substantially long [7]. A shorter, more specific alternative can be found in the Vaginal Penetration Cognitions Questionnaire.

The Vaginal Penetration Cognition Questionnaire (VPCQ) is a 22-item instrument originally developed in English that has been previously validated [4] and translated into other languages, such as Turkish [8] and Persian [9]. However, to the best of our knowledge, a validated translated Spanish version of the VPCQ is lacking, limiting its use by clinicians in Spanish-speaking communities. The VPCQ includes items that are related to control, catastrophizing thoughts, pain, self-image, and genital incompatibility, and includes positive thoughts in its assessment. For this reason, it is a comprehensively complete instrument that assesses beliefs about vaginal penetration. The aim of this study was to translate the VPCQ in Spanish and assess its psychometric properties within a population of women suffering from GPPPD.

2. Materials and Methods

2.1. Participants

This cross-sectional study was conducted between November 2022 and January 2023. Members of the research team, through their social network accounts and the communication channels of the Faculty of Physiotherapy of the University of Valencia and the Chartered Society of Physiotherapists of Valencia, recruited potential participants through online surveys. A convenience sample of women suffering from GPPPD was recruited. Participants were included if they met the following criteria: (1) adult women (>18 years old), (2) pain episodes in the genital area before, during or after vaginal intercourse for a period lasting at least 3 months, and (3) able to read and write in Spanish. Participants were excluded if they suffered any medical history of other pathophysiological conditions such as infection, gynaecological cancer, vulvar dermatological conditions, painful bladder syndrome, pregnancy, or pelvic surgery, and if they were unable to understand Spanish. Participants were briefed on the study purpose and gave written consent to participate. Ethics approval was obtained from the Ethical Committee in Human Research at the University of Valencia, Spain (UV-INV_ETICA-2557852).

2.2. Measures

Baseline demographic information from the sample was obtained, including age, marital status, level of education, and pain duration.

The Vaginal Penetration Cognition Questionnaire is a self-reported instrument designed to assess the thoughts and feelings of women with sexual dysfunctions regarding vaginal penetration. Its original English version included 22 items [4]. It can be answered using a Likert-style scale, ranging from 0 (not at all applicable) to 6 (very strongly applicable). This instrument measures five different aspects of vaginal penetration, classified in subscales, including (1) lack of control of one's own body and situation during penetration, (2) negative and catastrophic cognitions about future vaginal penetration and expectation of pain, (3) negative cognitions about self-image related to vaginal penetration, (4) positive cognitions, and (5) cognitions regarding genital incompatibility. Scores in each subscale range from 0 to 30 points. Higher scores in positive cognitions indicate

better sexual functioning and higher scores in the rest of the subscales indicate higher sexual impairment.

2.3. Procedures

2.3.1. Translation and Cultural Adaptation

Before starting the translation and cross-cultural adaptation process, a member of the research team in charge of developing the original English version (Dr. Moniek M. Ter Kuile) was contacted and granted us permission to translate and adapt the VPCQ into Spanish. For a questionnaire to be used in a new language and cultural setting, a comprehensive translation and cultural adaptation must be followed according to established guidelines [10]. The translation process was conducted according to the following steps: (1) The first author (BPD), a native Spanish speaker with fluent English level, translated every item from its original English version to Spanish, and (2) this translation was checked by another author (ALB) who is also fluent in both languages, and any differences in the translation process between both authors were resolved by consensus. Finally, (3) another author (JC), who is also fluent in both languages, back translated the Spanish version to English again. The research team approved the final version of the translated questionnaire by consensus.

2.3.2. Data Collection

Data was collected by a member of the research team and was registered in a separate spreadsheet. Participants were contacted online through a survey created in Google Forms, containing a first block of questions involving their demographic data and a second block of questions containing the VPCQ in Spanish, and responses to that survey were accessed by this researcher. To assess test–retest reliability, a subset of 89 participants who originally completed the online survey was contacted and asked to complete the survey a second time, a week after the completion of the first survey.

2.4. Statistical Analysis

Statistical analyses for validity, test–retest reliability, and internal consistency were performed using the SPSS Statistics (IBM, Armonk, NY, USA) software, in its 22.0 version for MacOS. Baseline demographic information was described as means (standard deviations) for continuous data, and counts (percentages) for categorical data. Normal distribution of data was checked through the Kolmogorov–Smirnov test. Missing values were resolved through the imputation method, by replacing them with the participant's average response.

2.4.1. Sample Size Estimation

Sample size calculation was performed according to published guidelines that establish requirements for survey tool validation (10 participants per item in the tool) [11]. Additionally, the consensus-based standards for the selection of health status measurement instrument (COSMIN) recommendations were followed to perform a structural validity analysis in a sample with an appropriate number of participants, establishing a minimum sample of seven times the number of items and $\geq$100 [12]. The VPCQ is a 22-item questionnaire, therefore a sample of at least 220 participants was required.

2.4.2. Validity

The validity of the VPCQ was assessed by using an exploratory factor analysis (EFA), and by determining its convergent and discriminant validity [13]. EFA was conducted through an exploratory principal component analysis (PCA) with Varimax rotation, and the number of suitable domains was extracted using the Scree-test criteria [14]. Sampling adequacy was established with the Kaiser–Meyer–Olkin (KMO) measure at >0.5, and the level of significance was established according to the Bartlett test of sphericity [15,16].

Convergent validity of the VPCQ was assessed using the procedure suggested by Fornell and Larcker [17], i.e., calculating the average variance extracted (AVE) and maximum

shared squared variance (MSV). Values of AVE between 0.5 and 0.7 indicate acceptable convergent validity, and values > 0.7 indicate good convergent validity. To confirm discriminant validity, values of the MSV must be lower than those of the AVE [9].

2.4.3. Test–Retest Reliability

Test–retest reliability assesses a measure's stability over time. A measurement is assessed twice over the same group of people and results from both measurements are correlated. The Intraclass Correlation Coefficient (ICC) (model-alpha, 2-way random effects model) was used in this study, establishing scores that ranged from 0 to 1, with 0 being no correlation at all and 1 the highest level of possible correlation. Based on published guidelines [18], scores ranging from 0 to 0.4 indicate low correlation, from 0.4 to 0.6 indicate moderate correlation, from 0.6 to 0.8 indicate average correlation, and scores above 0.8 indicate high correlation levels. Additionally, a Bland–Altman graphical representation was constructed by plotting the mean differences of both measurements with their corresponding limits of average difference ± standard deviation of the difference [19].

Measurement error was also assessed by calculating the standard error of measurement (SEM) and the minimal detectable change (MDC). SEM was calculated using the formula $SD \times \sqrt{(1 - R)}$, where SD is the Standard Deviation and R is the reliability coefficient of the instrument [20]. MDC was calculated with the following formula: $1.96 \times \sqrt{2} \times$ SEM.

2.4.4. Internal Consistency

Internal consistency refers to the level of interrelationship of the items of a measurement among themselves. Cronbach's α was used to assess the internal consistency in this study, values ranging between 0 and 1, and the closer to 1 the values are, the better internal consistency. Based on published guidelines [21], Cronbach's α values > 0.7 indicate acceptable internal consistency, >0.8 good internal consistency, and >0.9 excellent internal consistency.

3. Results

3.1. Descriptive Statistics

A final total of 225 women were included in the study. Baseline demographic characteristics of the sample are detailed in Table 1. The mean age of the participants was 31.3 years (SD 6.1), and they had suffered GPPPD for a mean average of 24.2 months (SD 13.1). More than half of the women in the sample were single (55%), and 92% of them had at least a High School education level. The Spanish version of the VPCQ (VPCQ-Sp) scores had a mean of 95.0 (SD 13.3) points.

Table 1. Baseline demographic characteristics from the sample.

Outcome		Mean (SD) or n (%)
Age (years)		31.3 (6.9)
Pain duration (months)		24.2 (13.1)
Marital status	Married	83 (37%)
	Divorced	15 (7%)
	Separated	3 (1%)
	Widowed	1 (0%)
	Single	123 (55%)
Educational level		
	Uneducated	0 (0%)
	Primary	18 (8%)
	High School	116 (52%)
	College	91 (40%)

SD: Standard Deviation.

3.2. Validity

Results for the exploratory factor analysis and convergent and divergent validity are shown in Table 2. The KMO value for assessing the adequacy of sampling was 0.71, and Bartlett's test score was X2 = 1868.08 ($p < 0.001$). The EFA yielded a total of four domains (control cognitions, catastrophic and pain cognitions, self-image cognitions, and positive cognitions), which determined 62.5% of the variance in the VPCQ-Sp items. The first domain, "control cognitions", explained 8.6% of the variance; the second domain, "catastrophic and pain cognition", explained 17% of the variance; the third domain, "self-image cognitions", explained 14.6% of the variance; and the fourth domain, "positive cognitions", explained 22.3% of the variance.

Table 2. Exploratory factor analysis results, convergent and discriminant validity of the Spanish version of the VPCQ.

Domain	Mean (SD)	Loading	Variance (%)	AVE	MSV
1. Control cognitions			8.6	0.513	0.387
Item 2. Tengo miedo de perder el control sobre la situación durante la penetración	5.1 (1.2)	0.692			
Item 6. Tengo miedo de entrar en pánico durante la penetración	4.5 (2.3)	0.809			
Item 20. Tengo miedo de no poder influir sobre lo que sucede durante la penetración	5.0 (1.4)	0.718			
Item 21. No saber qué ocurre en mi cuerpo durante la penetración me da miedo	5.7 (0.3)	0.662			
2. Catastrophic and pain cognitions			17.0	0.621	0.515
Item 5. Lo más seguro es que la penetración no sea posible	4.9 (1.2)	0.733			
Item 7. Tengo miedo de que la penetración se vuelva más difícil en un futuro	5.1 (1.8)	0.660			
Item 9. Tengo miedo de que el dolor en la penetración vaya a más en un futuro	5.3 (0.9)	0.666			
Item 11. Seguramente la penetración no se podrá realizar	5.6 (1.4)	0.693			
13. El pene de mi pareja es demasiado grande para mi vagina	3.1 (2.3)	0.527			
Item 16. Tengo miedo de sentir calambres durante la penetración	4.5 (0.8)	0.748			
3. Self-image cognitions			14.6	0.585	0.515
Item 1. Tengo miedo de que mi vagina sea demasiado estrecha para la penetración	4.5 (0.7)	0.497			
Item 8. Sólo me siento una "mujer completa" cuando la penetración es posible	2.1 (1.3)	0.707			
Item 10. Soy una mala pareja cuando la penetración no es posible	2.5 (1.0)	0.715			
Item 15. Soy la única en el mundo con la que la penetración no es posible	2.8 (1.5)	0.524			
Item 17. Me siento culpable cuando la penetración no es posible	5.5 (0.9)	0.635			
Item 19. Tengo miedo de que mi pareja me deje porque la penetración no es posible	3.8 (2.7)	0.786			
4. Positive cognitions			22.3	0.601	0.301
Item 3. Siento que la penetración será agradable	4.0 (1.6)	0.744			
Item 4. La penetración es un momento de intimidad con mi pareja	5.3 (0.5)	0.623			
Item 12. Me excitaré sexualmente con la penetración	4.0 (1.3)	0.762			
Item 14. La penetración será agradable	4.2 (2.1)	0.857			
Item 18. La penetración acabará en un orgasmo	4.8 (1.3)	0.613			
Item 22. Aunque la penetración no sea posible, soy una buena pareja sexual	3.6 (1.3)	−0.663			

AVE values were 0.513 for control cognitions, 0.621 for catastrophic and pain cognitions, 0.585 for self-image cognitions, and 0.601 for positive cognitions. All of them were above 0.5, therefore showing an acceptable convergent validity. Additionally, MSV values for every domain were lower than the AVE values; therefore, discriminant validity was also confirmed.

3.3. Test–Retest Reliability

Results for test–retest reliability are shown in Table 3. The overall intraclass correlation coefficient for the VPCQ-Sp was 0.90 (95% CI 0.85 to 0.93). Out of the total of 22 items, 20 showed high correlation levels (items 1–7, 9, and 11–22), with correlation values ranging from 0.80 to 0.97. The remaining two items, 8 and 10, showed average correlation levels of 0.75 and 0.78, respectively. The standard error of measurement was 4.21, and the minimal detectable change was 11.66 points. The Bland–Altman plot (Figure 1) shows that most of the pair differences are between the agreement limits, implying a high concordance between the test–retest measures of the VPCQ-Sp.

Table 3. Intraclass correlations of the items in the Spanish version of the VPCQ.

Item	Description	ICC	95% CI	SEM	MDC
Total		0.90	0.85–0.93	4.21	11.66
1	Tengo miedo de que mi vagina sea demasiado estrecha para la penetración	0.85	0.74–0.94		
2	Tengo miedo de perder el control sobre la situación durante la penetración	0.81	0.78–0.84		
3	Siento que la penetración será agradable	0.80	0.71–0.88		
4	La penetración es un momento de intimidad con mi pareja	0.95	0.88–0.97		
5	Lo más seguro es que la penetración no sea posible	0.92	0.87–0.95		
6	Tengo miedo de entrar en pánico durante la penetración	0.86	0.80–0.89		
7	Tengo miedo de que la penetración se vuelva más difícil en un futuro	0.86	0.82–0.93		
8	Sólo me siento una "mujer completa" cuando la penetración es posible	0.75	0.68–0.79		
9	Tengo miedo de que el dolor en la penetración vaya a más en un futuro	0.95	0.92–0.97		
10	Soy una mala pareja cuando la penetración no es posible	0.78	0.70–0.81		
11	Seguramente la penetración no se podrá realizar	0.90	0.86–0.93		
12	Me excitaré sexualmente con la penetración	0.93	0.91–0.96		
13	El pene de mi pareja es demasiado grande para mi vagina	0.85	0.73–0.95		
14	La penetración será agradable	0.93	0.89–0.95		
15	Soy la única en el mundo con la que la penetración no es posible	0.82	0.79–0.83		
16	Tengo miedo de sentir calambres durante la penetración	0.94	0.92–0.98		
17	Me siento culpable cuando la penetración no es posible	0.92	0.90–0.95		
18	La penetración acabará en un orgasmo	0.90	0.87–0.92		
19	Tengo miedo de que mi pareja me deje porque la penetración no es posible	0.82	0.79–0.84		
20	Tengo miedo de no poder influir sobre lo que sucede durante la penetración	0.95	0.93–0.96		
21	No saber qué ocurre en mi cuerpo durante la penetración me da miedo	0.97	0.95–0.98		
22	Aunque la penetración no sea posible, soy una buena pareja sexual	0.88	0.85–0.90		

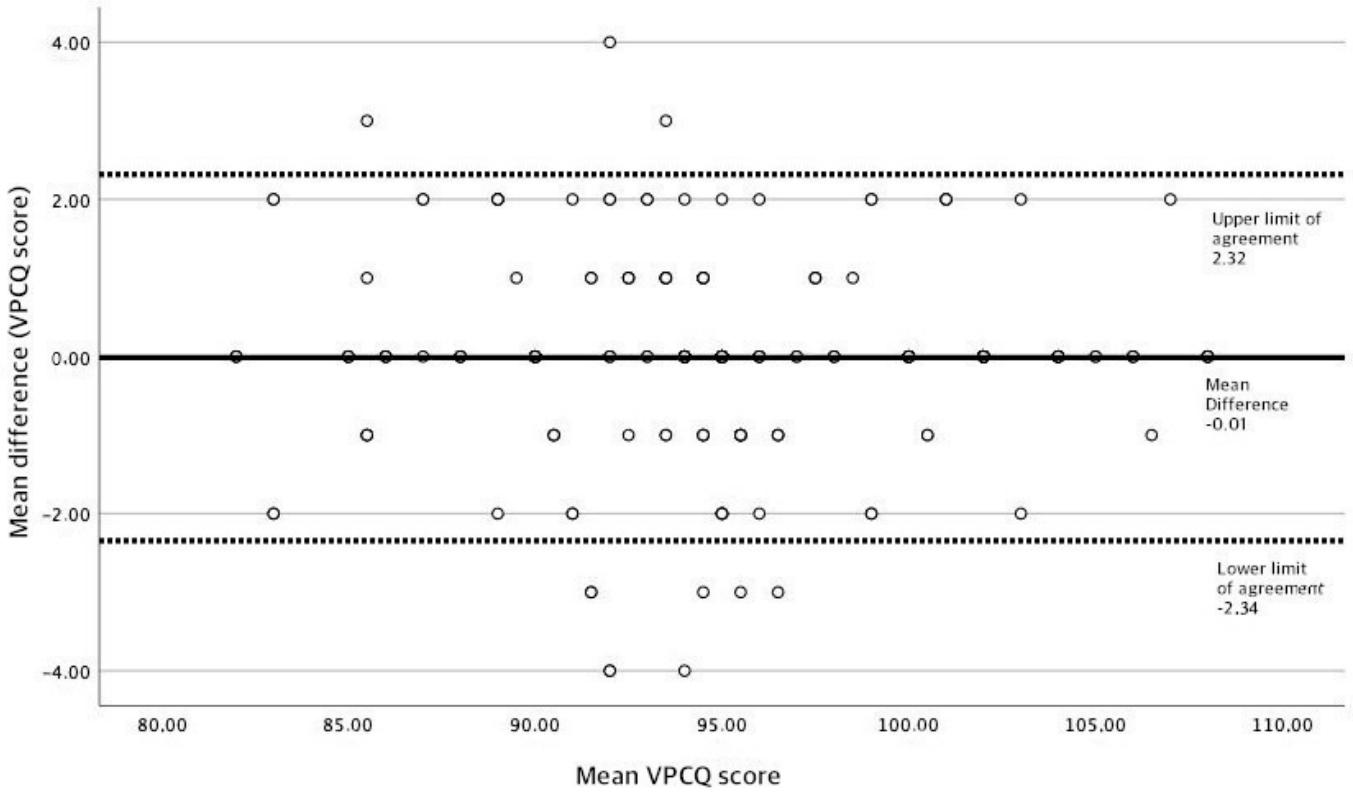

Figure 1. Bland–Altman plot VPCQ total score.

3.4. Internal Consistency

Results for the internal consistency of the domains of the VPCQ-Sp are shown in Table 4. Every domain showed good internal consistency values. Cronbach's α values for the first domain, "control cognitions", were 0.89 (95% CI 0.87–0.92); for the second domain, "catastrophic and pain cognition", 0.84 (95% CI 0.81–0.86); for the third domain, "self-image cognitions", 0.86 (95% CI 0.83–0.89); and for the fourth domain, "positive cognitions", 0.84 (95% CI 0.82–0.87).

Table 4. Internal consistency coefficients for the factors of the Spanish version of the VPCQ.

Domain	Cronbach's α (95% CI)
1. Control cognitions	0.89 (0.87–0.92)
2. Catastrophic and pain cognitions	0.84 (0.81–0.86)
3. Self-image cognitions	0.86 (0.83–0.89)
4. Positive cognitions	0.84 (0.82–0.87)

4. Discussion

This is the first study that assesses the psychometric properties of the Spanish version of the VPCQ. Our results show that VPCQ-Sp has high test–retest reliability and excellent internal consistency levels, along with acceptable convergent and discriminant validity. The VPCQ was originally developed by Klaasen and Ter Kuile [4] in English, and they proved it was a reliable and valid instrument to assess cognitions about vaginal penetration in a Dutch population. Furthermore, Dogan et al. [8] and Banaei et al. [9] developed versions translated into Turkish and Persian, respectively.

The above-mentioned studies conducted their analyses in samples of women that suffered from vaginismus and dyspareunia. Our sample was composed of women diagnosed with GPPPD, so although both vaginismus and dyspareunia are conditions considered to be included within the GPPPD spectrum, there was no differentiation of patient diagnosis in this study, as proposed by other authors [22,23]. Despite this, our sample shared similar ages and educational levels to those found in the original [4] and Persian translated version [9] studies, so results are consistent throughout the literature with similar samples. However, to further understand the applicability of the instrument in women with different conditions, further analyses should be explored, and differences between women diagnosed with different conditions should be analysed.

The exploratory factor analysis yielded four domains. This contrasts with the original version, which enhanced the importance of genital incompatibility as a domain per se. The original developers suggest that "vaginismus" should be reconceptualized as either an "aversion or phobia" to vaginal penetration, so the consideration of genital incompatibility as a relevant domain might be linked with this fear-avoidance behaviour rather than with the actual condition [4]. Additionally, our exploratory factor analysis contrasts with the Persian version, as authors conducting this study yielded three domains, combining three domains from the original study (catastrophic and pain cognitions, control cognitions, and genital incompatibility cognitions) into one single domain (catastrophic and control cognition). These differences between versions might be related to the cultural setting in which they are conducted, as there might be subtle language variations or interpretations of some of the items depending on the country in which the items are assessed. Authors of the Persian version even suggest assessing differences within samples from the same country, as multi-cultural countries, such as Iran or Spain, could present different results in different regions.

Validity assessments showed acceptable convergent and discriminant validity levels. The Persian translated version [9] found similar convergent validity results, but a second confirmatory factor analysis was performed because discriminant validity was not confirmed. These differences might also imply the relevance of cultural and social setting when

assessing the relatedness of these instruments to their construct, as these thoughts could vary depending on how "taboo" they are perceived to be in a society [24].

Test–retest reliability results are consistent with those found both in the original and translated versions. Every item scored high reliability values except for items 8 and 10. These two items deal with relatively ambiguous concepts such as "being a complete woman" and "being a good partner"; beliefs often influenced by multiple factors which could be a possible explanation for this finding. These items could be interpreted ambiguously, not only between validated versions, but also between assessments within the same sample, as every woman has her own perspective of what "a complete woman" or a "good partner" is.

In this study, good internal consistency values were found. Previous studies have also shown similar values of Cronbach's α on their subscales, ranging from 0.70 to 0.83 in the original version [4], 0.82 to 0.93 in the Persian version [9], and 0.71 to 0.92 in the Turkish version [8]. However, Banaei et al. also assessed the composite reliability (CR) in their study, arguing this is a much more accurate and reliable assessment because, compared to Cronbach's α, it is not affected by the number of items and structure of the instrument. This should be taken under account when conducting future internal consistency assessments. Additionally, it should be noted that, to the best of our knowledge, this is the first study to calculate the SEM and the MDC.

The study results must be taken cautiously due to the following limitations. Firstly, even though the translation process was conducted with maximal effort, we do have to consider that the sample in this study is from a different country and cultural setting than that found in similar studies, and that might influence subtle linguistical variations or item interpretations. Another limitation could be that, in this study, there was no registration of the history of treatments participants had received. Participants could have asked for professional help prior to this study, and if they received any kind of therapeutic educational intervention or cognitive therapy, these might have had a significant influence on their answers.

However, this is the first translation of the VPCQ in Spanish, a language spoken by over 548.3 million speakers around the world, and the native language of over 20 countries [25]. Therefore, the development of the Spanish version of the VPCQ could imply a relevant addition for so many clinicians and researchers. Adding validated instruments to the complex diagnosis of women suffering from these conditions could bring clinicians closer to a more effective therapeutic approach.

Finally, this is a preliminary validation study, as further statistical analyses could have been performed. This study serves as the first steppingstone towards a complete validation process. Future studies should focus on conducting a confirmatory factor analysis on a different sample, an analysis of the invariance with respect to the original instrument, and a correlation analysis between the VPCQ and a similar validated instrument in Spanish. This last analysis could be challenging, as there are very few validated instruments that assess a similar construct, so initial correlational analyses should focus on constructs that are as close as possible, such as sexual function or pain cognitions.

5. Conclusions

This is a preliminary study that translated and culturally adapted the Vaginal Penetration Cognition Questionnaire in Spanish. The Spanish version of the Vaginal Penetration Cognition Questionnaire is a valid, reliable, and consistent tool for assessing vaginal penetration cognitions in women suffering from Genito-Pelvic Pain/Penetration Disorder.

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Decision Letter (PTJ-2023-0849.R2)
From:janreynolds@apta.org
To: f.borja.perez@uv.es
CC: michellelenker@apta.org, kellenmccarthy@apta.org
Subject: Manuscript Decision PTJ-2023-0849.R2; Online Graded Motor Imagery is effective in women diagnosed with Pelvic Pain. A randomized controlled trial.
Body: 14-Jul-2024

Dear Dr. Perez-Dominguez:

On behalf of Editor-in-Chief Dr Steve George and Editorial Board Member Dr. Lori Tuttle, congratulations! Your manuscript, "Online Graded Motor Imagery is effective in women diagnosed with Pelvic Pain. A randomized controlled trial.," has been accepted by *PTJ: Physical Therapy & Rehabilitation Journal* (Phys Ther). It is now undergoing a quality check process conducted by the Editorial Office. This check includes table editing and formatting (which must be done before a paper enters production), person-first language check, and other key elements that need to be checked before your manuscript can be published as an author manuscript online ahead of issue. This process may take up to 30 days depending on variables such as number of tables, figures, statistics used, and language usage concerns. You will be contacted if any questions arise.

Thank you again for the privilege of reviewing and publishing your important work.

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