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Stroke and sexual health: A systematic review of psychological interventions aimed at improving sexual health of stroke survivors

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**STROKE AND SEXUAL HEALTH: A SYSTEMATIC REVIEW OF
PSYCHOLOGICAL INTERVENTIONS AIMED AT IMPROVING SEXUAL
HEALTH OF STROKE SURVIVORS**

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RESUMO

Objetivos: Avaliar a eficácia de intervenções não-farmacológicas e de intervenções digitais destinadas à melhoria da saúde sexual dos sobreviventes de AVC que se encontrem documentadas na literatura.

Método: As bases de dados pesquisadas foram MEDLINE (PubMed), Web of Science, EBSCO (APA PsycINFO e APA PsycArticles) e Cochrane. Seguindo as diretrizes PRISMA, os dados foram recolhidos por um único autor, com a consultoria dos coautores aquando da necessidade de esclarecimentos e clarificação. Apenas foram incluídas publicações originais em inglês. O risco de viés foi avaliado usando ferramentas como ROBINS-I, Cochrane Collaboration's Risk of Bias Tool e Joanna Briggs Institute (JBI) Critical Appraisal Checklist.

Resultados: De um total inicial de 1053 publicações identificadas, foram incluídos 5 estudos. O design dos estudos abrangeu estudos clínicos randomizados, um estudo quasi-experimental, um estudo transversal e um estudo de caso. Não foram identificados estudos sobre eficácia de intervenções digitais. O modelo de intervenção predominante utilizado na maioria dos estudos foi o modelo PLISSIT, com ou sem suplementos psico-educativos.

Conclusões: Apesar da literatura disponível apontar para a existência de benefícios das intervenções psicoterapêuticas na promoção da saúde sexual de sobreviventes de AVC, os dados mostraram diferenças no grau dessa eficácia, mesmo entre as que se basearam no modelo PLISSIT. A presente investigação sublinha os potenciais benefícios de intervenções adaptadas para a reabilitação sexual pós-AVC e destaca áreas para investigação futura.

Palavras-chave: Saúde sexual, sobreviventes de AVC, intervenções não farmacológicas, intervenções digitais, revisão sistemática

Abstract

Objectives: Evaluate the efficacy of non-pharmacological interventions and digital interventions aimed at improving the sexual health of stroke survivors documented in the literature.

Method: The databases searched were MEDLINE (PubMed), Web of Science, EBSCO (APA PsycINFO and APA PsycArticles), and Cochrane. Following PRISMA guidelines, data were collected by a single author, with the consultation of co-authors when clarifications were needed. Only original publications in English were included. The risk of bias was assessed using tools such as ROBINS-I, Cochrane Collaboration's Risk of Bias Tool, and the Joanna Briggs Institute (JBI) Critical Appraisal Checklist.

Results: From an initial total of 1053 publications identified, 5 studies were included. The study designs included randomized clinical studies, a quasi-experimental study, a cross-sectional study, and a case study. No studies were identified on the efficacy of digital interventions. The predominant intervention model used in most of the studies was the PLISSIT model, with or without psycho-educational supplements.

Conclusions: Although available literature points to the benefits of psychotherapeutic interventions in promoting the sexual health of stroke survivors, the data showed differences in the degree of this efficacy, even among those based on the PLISSIT model. This research underscores the potential benefits of tailored interventions for post-stroke sexual rehabilitation and highlights areas for future research.

Keywords: Sexual health, stroke survivors, non-pharmacological interventions, digital interventions, systematic review

RÉSUMÉ

Objectifs : Évaluer l'efficacité des interventions non pharmacologiques et des interventions numériques visant à améliorer la santé sexuelle des survivants d'AVC documentées dans la littérature.

Méthode : Les bases de données consultées étaient MEDLINE (PubMed), Web of Science, EBSCO (APA PsycINFO et APA PsycArticles) et Cochrane. Suivant les directives PRISMA, les données ont été collectées par un seul auteur, avec la consultation des coauteurs en cas de besoin de clarifications. Seules les publications originales en anglais ont été incluses. Le risque de biais a été évalué à l'aide d'outils tels que ROBINS-I, l'outil de risque de biais de la Cochrane Collaboration et la liste de contrôle d'évaluation critique de l'Institut Joanna Briggs (JBI).

Résultats : Sur un total initial de 1053 publications identifiées, 5 études ont été incluses. Les designs des études comprenaient des études cliniques randomisées, une étude quasi-expérimentale, une étude transversale et une étude de cas. Aucune étude n'a été identifiée sur l'efficacité des interventions numériques. Le modèle d'intervention prédominant utilisé dans la plupart des études était le modèle PLISSIT, avec ou sans suppléments psycho-éducatifs.

Conclusions : Bien que la littérature disponible suggère les avantages des interventions psychothérapeutiques pour promouvoir la santé sexuelle des survivants d'AVC, les données ont montré des différences dans le degré de cette efficacité, même parmi celles basées sur le modèle PLISSIT. Cette recherche souligne les avantages potentiels des interventions adaptées à la réadaptation sexuelle après un AVC et met en évidence des domaines pour la recherche future.

Mots-clés : Santé sexuelle, survivants d'AVC, interventions non pharmacologiques, interventions numériques, revue systématique.

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Introduction

Each year, an estimated 15 million individuals experience a cerebrovascular event (Cuesta & Gettings, 2022). Stroke is characterized by the death of brain cells as a result of insufficient blood supply in the brain, leading to a deprivation of essential oxygen and nutrients to brain cells (Cuesta & Gettings, 2022). Recent data shows that stroke is the second leading cause of death worldwide, accounting for approximately 11% of total deaths (World Health Organization [WHO], 2020). According to the Instituto Nacional de Estatística (Instituto Nacional de Estatística [INE], 2020), cerebrovascular accidents were responsible for the highest number of deaths in 2018, with a total of 11,235 fatalities, in Portugal. This accounted for 9.9% of the overall mortality rate, indicating a slight improvement compared to the previous year, which saw 11,270 deaths and a 10.2% mortality rate. In 2021, cerebrovascular accidents remained prominent, causing 9,613 deaths, although this figure reflected a 16% decrease compared to the previous year (INE, 2023).

The World Health Organization (WHO, 1980) defines a stroke by the rapid onset of clinical signs of cerebral impairment that persist for over 24 hours or lead to death, with vascular origin being the only identifiable cause. Although widely accepted, the American Heart Association and the American Stroke Association consider this definition outdated, mainly because of its strict focus on clinical symptoms. Based on a deeper understanding of strokes and insights from imaging, they argue that the definition should be broadened to include silent pathology (imaging-detected abnormalities without symptoms) (Sacco et al., 2013). This inclusion contrasts with the stance of the European Stroke Organization and the World Stroke Organization, which exclude silent pathology (Fanning et al., 2014). Given these differing views and the need to cover a broad range of stroke cases, this review adopts a comprehensive definition, considering all studies regardless of their specific stroke criteria.

In addition to its significant mortality impact, stroke ranks third among the top 10 global causes of disability-adjusted life years (DALYs). DALYs provide a comprehensive measure of the disease burden, considering both premature mortality and years of healthy life lost due to disability (Global Health Estimates, 2020). This highlights the substantial impact of stroke on both mortality and morbidity, making it a critical public health concern.

Building upon this perspective of morbidity, it is vital to note that beyond motor disability and cognitive changes, which are widely recognized contributors to the burden of stroke, difficulties associated with sexuality are also frequent. Furthermore, medications prescribed for stroke can also contribute and exacerbate sexual difficulties (Boller et al., 2015). Mobility limitations from a stroke bring challenges during intimate situations since they can impact comfort and positioning, as shown by different studies indicating a direct correlation between the severity of motor disability in stroke survivors and a decrease in sexual activity (Park et al., 2015; Boller et al., 2015). It is worth noting that while hyposexuality is commonly associated with most strokes, hypersexuality can also occur as a result (Boller et al., 2015; Korpelainen et al., 1999). Despite the prevalence of post-stroke sexual dysfunction often being underestimated, it arises from a combination of factors. Psychosocial factors are also contributing causes and post-stroke sexual dysfunction can develop even in survivors with minimal physical impairment (Park et al., 2015). It is crucial to recognize that motor problems are not the only cause of sexual issues after a stroke, as sexual dysfunction is not the sole dimension of sexuality affected by a stroke. To encompass the full spectrum of post-stroke sexual difficulties it is essential to adopt a comprehensive perspective on sexual health. The WHO definition of sexual health encompasses physical, emotional, mental, and social well-being concerning sexuality. It is not merely about the absence of disease or dysfunction but requires a positive, respectful approach to sexuality and relationships (WHO, 2006).

Drawing from this definition, we can infer that stroke survivors might encounter challenges across multiple dimensions of their sexual and relational health. Some of the most frequent ones are sexual dissatisfaction, characterized by reduced pleasure during intimacy (Hall, 2013; Korpelainen et al., 1999), and sexual distress, manifested through the perceived anxiety regarding their own sexual experiences and concerns about partner satisfaction (Hall, 2013; Korpelainen et al., 1999). Moreover, this distress can become even more intense when we consider the merging roles of spouse and caregiver (Hall, 2013). In addition, the physical repercussions of a stroke (e.g. muscle weakness, altered sensation, fatigue, incontinence) can negatively affect sexual activity (Gustafsson & Arfaras, 2022; Hall, 2013; Korpelainen et al., 1999; Rosenbaum et al., 2014). However, the challenges these patients face are so much broader. Because of emotional imbalances post-stroke, irritability, sadness, depressive mood, and reduced sexual desire, common symptoms in these patients, their intimacy could

be highly and negatively impacted (Contrada et al., 2023; Hall, 2013; Korpelainen et al., 1999). In the same way, on a relational level, post-stroke dynamics often change, with the role of caregiver and the role of care seeker becoming more evident (Hall, 2013; Smith et al., 2012). Thus, this change can impair communication, affect self-perception, and modify the individual's position in the relationship (Hall, 2013).

Although the complex dimensions of post-stroke sexual health are increasingly understood, addressing them in clinical practice remains a challenge (Low et al., 2022; McLaughlin & Cregan, 2005; Mellor et al., 2013; Prior et al., 2019; Richards et al., 2016; Rosenbaum et al., 2014; Vikan et al., 2019). This is primarily because access to specialized care for post-stroke sexual health is often limited, ranging from geographical constraints to financial limitations, and organizational priorities focus mainly on immediate rehabilitation needs, forgetting all the relational, emotional, and sexual dimensions triggered later, which also need to be dealt with (Richards et al., 2016). Thus, this narrow focus can overshadow the multifaceted dimensions of post-stroke sexual health. In addition, this gap is further exacerbated by social stigma and discomfort when discussing sexual health, both among survivors and even within the medical team (Low et al., 2022; McLaughlin & Cregan, 2005; Mellor et al., 2013; Richards et al., 2016; Vikan et al., 2019). In this way, several authors refer to the lack of specialized training for health professionals working with these patients, which leads to the recovery of the various dimensions impacted by stroke being, in more cases, marginalized (Contrada et al., 2023; Low et al., 2022; McLaughlin & Cregan, 2005; Mellor et al., 2013; Richards et al., 2016; Rosenbaum et al., 2014; Vikan et al., 2019). Thus, as suggested in the literature, a broader shift in organizational priorities becomes crucial, as well as an investment in specialized training for health professionals working with these populations (Contrada et al., 2023; Richards et al., 2016). This sets the stage for the literature's insights into post-stroke sexual health, emphasizing the urgent need for comprehensive interventions that go beyond the physiological to address the psychological and relational dimensions of post-stroke sexuality (Grenier-Genest et al., 2017).

Previous reviews on the topic of evidence-based intervention in sexual rehabilitation after a stroke have been published in recent years. Grenier-Genest and colleagues (2017) conducted a literature review focusing on post-stroke sexual functioning and available sexual rehabilitation programs for stroke patients. The authors used PubMed and restricted the

included study designs to clinical trials, journal articles, RCTs, and clinical studies, with the exclusion of single or multiple case reports, qualitative case studies, and opinion articles. The data revealed prominent associations between stroke and sexual dysfunction in both genders, affecting areas as sexual desire and overall sexual satisfaction. The precise impact of patient's neurological characteristics (stroke laterality, location, and severity) on sexual dysfunction remained unclear due to varied research findings. Psychological factors were also recognized as having a significant role in the onset of post-stroke sexual dysfunctions. Finally, the authors identified a limited number of intervention programs aimed at guiding healthcare professionals in post-stroke sexual recovery and underscored the importance of integrating sexual rehabilitation as an essential component of the comprehensive stroke rehabilitation strategy, favoring an interdisciplinary approach (Grenier-Genest et al., 2017).

Stratton and colleagues (2020) conducted a literature review focusing on interventions for sexual dysfunction following stroke. Their primary objectives were to assess the efficacy of interventions to reduce sexual dysfunction following stroke; and to assess adverse events associated with interventions for sexual dysfunction following stroke. Several databases including the Cochrane Central Register of Controlled Trials; MEDLINE; Embase; Physiotherapy Evidence Database; and 10 additional bibliographic databases and ongoing trial registers were searched. The study included RCTs comparing pharmacological treatments, mechanical devices, complementary medicine, and other non-pharmacological interventions, such as education, with placebo or the standard treatment of care. The authors identified three RCTs involving a total of 212 individuals. The trials varied significantly in their interventions approach, (one pharmacological, one physiotherapy-based, and one psychoeducational), and all RCTs used small samples and were of “low” or “very low” quality. Consequently, data was insufficient to provide any reliable indication of benefit or risk to guide clinical practice in terms of the use of sertraline, specific pelvic floor muscle training or individualized sexual rehabilitation in stroke survivors. In conclusion, the study emphasized that the current body of evidence was notably scant and of questionable quality, making it impossible to recommend any specific treatments for sexual dysfunction in the aftermath of a stroke (Stratton et al. 2020).

Auger et al. (2021) conducted a systematic review intended to compile and outline the most sustained evidence that supports treatments aimed at post-stroke sexual

rehabilitation. Medline, Embase, PsycINFO, CINAHL, Web of Science, PEDRO, and OTSeeker databases were searched until May 2020. Inclusion criteria required studies to have a sample with $\geq 50\%$ stroke patients and describe an intervention applicable by an allied health professional. Following the PRISMA guidelines, data was extracted by two independent reviewers, and interventions were detailed using the Template for Intervention Description and Replication checklist. Out of 2446 initially reviewed articles, only eight met the established criteria. Three of the identified studies (two RCTs and one non-RCT) indicated enhanced sexual function and satisfaction after a 30–45-minute structured rehabilitation program. Two separate RCTs indicated improvement in sexual function, with one focusing on structured physical and verbal sexual counseling and the other on pelvic floor muscle training. Moreover, interdisciplinary sexual rehabilitation was found to improve both satisfaction and sexual functioning in three studies. Notably, the introduction of a clinician interview script increased the percentage of professionals addressing sexuality from 0% to 80% within 10 months. Additionally, two-day retreats for couples were linked to increased perceived intimacy. In conclusion, Auger et al. (2021) identified structured sexual rehabilitation and pelvic floor muscle training as being the most efficient interventions in improving sexuality after stroke.

Even though the identified systematic reviews covered distinct studies and available interventions, emerging online interventions were not addressed. In a time defined by rapid technological advances, digital tools in healthcare are becoming increasingly relevant (Burdea, 2003; Kang et al., 2018). Thus, digital interventions can overcome geographic, physical, and financial barriers, promoting broad and inclusive access, with essential resources (Burdea, 2003; Kang et al., 2018; Matthew & Yang, 2020), particularly when accompanied by specialized support (Kang et al., 2018; Matthew et al., 2022). Given the sensitive nature of post-stroke sexual dysfunction, many survivors find solace in online interventions, through accessing resources in the privacy and comfort of their own homes, thanks to the anonymity features of many digital platforms, such an enabling environment is possible, potentially leading to greater engagement in interventions (Matthew et al., 2022). Another distinct advantage of the digital domain is its dynamic nature (Burdea, 2003), which encompasses multiple interventions aligned with the possibility of constant updates.

For all the above, post-stroke sexual health has been increasingly recognized as a pertinent area of research in clinical and academic research. However, clear gaps remain in the literature, specifically about the exploration of non-pharmacological interventions and their psychological implications. Moreover, most of the studies carried out, such as the work by Stratton et al. (2020), favored randomized clinical trials to explore post-stroke sexual health, which may limit the understanding of the sexual experience. Therefore, the present systematic review aims to fill these gaps, integrating qualitative and quantitative methodologies, as well as diverse study designs, with the purpose of capturing the comprehensive nature of the post-stroke sexual experience. The search strategy spanned beyond the specific databases employed by earlier reviews (Auger et al., 2021; Grenier-Genest et al., 2017; Stratton et al., 2020). By employing established risk-of-bias assessment tools, and making a pre-register of the research protocol, the review ensured the credibility and rigor of its findings, setting a benchmark for subsequent investigations. The first aim is to identify and analyze the main non-pharmacological interventions that improve sexual health in stroke survivors, together with their main conclusions. Likewise, the second aim is to explore the digital interventions present in the literature for these patients, understanding their characteristics and contributions. Ultimately, the last aim is to serve as a compass, guiding future research initiatives aimed at improving the lives of stroke survivors facing sexual health challenges.

Methods

1. Literature Search

The present systematic review complied with the principles outlined in the Preferred Reporting Items for Systematic Reviews (PRISMA) framework, as described by Page et al. (2021). Pre-registering was performed on PROSPERO (CRD42023429379).

For the literature search, at the date of 08 of January of 2023, four electronic databases were studied: MEDLINE (PubMed), Web of Science, EBSCO (APA PsycInfo and APA PsycArticles) and Cochrane. The search strategy involved the use of relevant terms and truncated terms related to sexuality and stroke. These terms were combined with the connector "AND" to encompass broader terms associated with the topic of interest, such as interventions and sexual health (see Appendix).

2. Inclusion Criteria

This review included treatment-outcome studies aimed at addressing the sexual health of men and/or women aged 18 years or older who had experienced a stroke. Studies examining the outcomes resulting from these non-pharmacological interventions were considered. Both traditional and digital interventions in various formats (such as mobile or desktop) were eligible for inclusion. Only original research published in English was included. Grey literature was excluded. Regarding study types, both qualitative and quantitative studies were included, as well as all study settings, allowing for a comprehensive analysis of the topic.

3. Study Selection

The search results from each source were synchronized into the Rayyan platform to ensure seamless collaboration among all team members. The initial step involved the automated removal of duplicates. In the first round of screening, the titles and abstracts of each article were carefully examined against the predetermined review eligibility criteria. Once this initial screening was complete, the number of potentially relevant articles was

recorded, representing the articles to be considered in the subsequent full-text screening stage. In the second round of screening, the full text of the potentially relevant articles was assessed using the same eligibility criteria. The final step involved evaluating the reports based on the full-text screening to determine their eligibility for inclusion in the review. Only articles that met the predetermined eligibility criteria were included in the review.

All stages of the search process and study selection were conducted by a single author (RB), who consulted with the co-authors (AG, PV, RP and PN) as needed for advice and clarification. Data extraction from the included studies followed the guidelines outlined in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins et al., 2019). A data extraction form was employed, encompassing information such as author(s), year of publication, journal, country, study design, study sample, type of intervention, outcomes, and main findings.

The primary outcomes focused on sexuality, specifically sexual function (e.g., FSFI Female Sexual Function Index, International Index of Erectile Function) or sexual satisfaction (e.g., Global Measure of Sexual Satisfaction, Dyadic Adjustment Scale) to assess the efficacy of the interventions. Qualitative studies involved conducting a perception analysis and identifying emerging themes through thematic analysis. Secondary outcomes included the number of participants and characteristics of interventions.

The strategy for data synthesis involved a narrative synthesis of the findings from the selected studies, structured around the type of intervention, contents and outcomes. Due to the range of different outcome measures and the small number of trials, the scope for meta-analysis was expected to be limited. However, if a sufficient number of studies using the same outcome measures were found, the results would be pooled.

4. Risk of bias assessment

In terms of risk of bias assessment, quantitative studies underwent evaluation using the ROBINS-I tool to assess the risk of bias in non-randomized studies (Sterne et al., 2016). For randomized controlled trials, the Cochrane Collaboration's Risk of Bias Tool (Sterne et al., 2019) was applied. Qualitative studies were evaluated for risk of bias using the Joanna

Briggs Institute (JBI) Critical Appraisal Checklist for Qualitative Research (Joanna Briggs Institute, 2017).

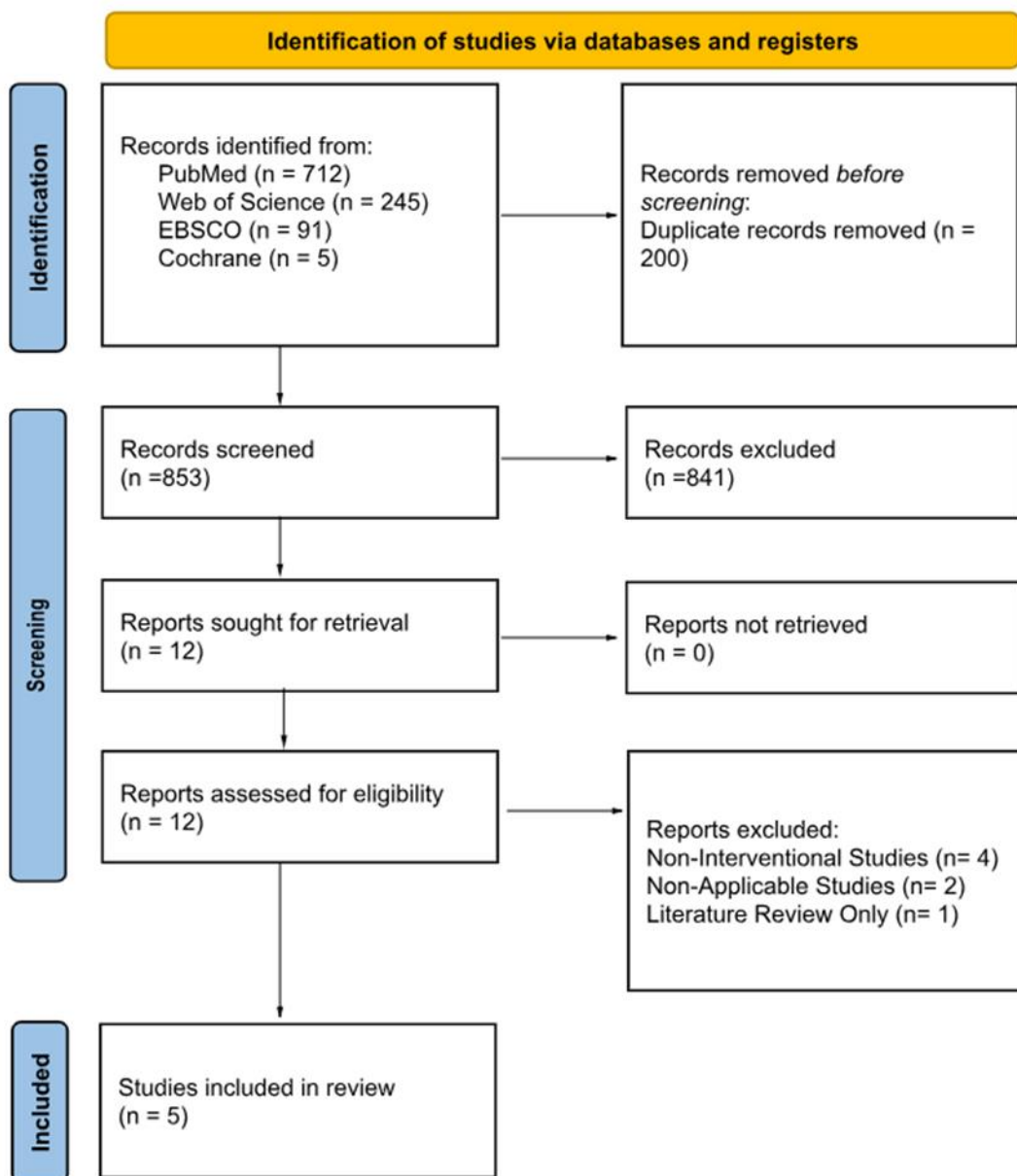
Results

1. Study selection

The process of identification and selection of eligible studies is displayed in Figure 1.

Figure 1

PRISMA flow diagram, showing identification and selection process of eligible studies



A total of 1053 publications were identified (Figure 1), consisting of 712 from PubMed, 245 from Web of Science, 91 from EBSCO, and five from Cochrane. Among these, due to publication, 64 articles were excluded automatically and an additional 136 were excluded manually, resulting in a total of 853 unique papers.

In the first phase of screening, just using the titles, 679 articles were excluded, leaving 174. In a second round examining titles and abstracts, this number rose to 739 articles, resulting in 114 articles being selected for a more detailed review. Upon a more meticulous analysis of these 114 articles, a decision was made on several of them: 34 were categorized as pending for inclusion, 28 were included, and 52 were excluded and presented to the team for evaluation. Ultimately, only 12 articles were deemed eligible for retrieval. Afterward, all 12 articles were successfully retrieved and proceeded to full-text screening.

The full-text screening process involved evaluating the potentially relevant articles against the eligibility criteria. Of these eligible articles, four (Auger, Allegue, et al., 2022; Auger, Pituch, et al., 2022; Nilsson et al., 2017; Schmitz & Finkelstein, 2010) did not refer to interventions or the examination of outcomes resulting from them, as a result, they were excluded and categorized in the flow diagram as “Non-Interventional”.

Within the “Non-Applicable Studies” category, one of the excluded studies (Simblett et al., 2013) was a computer-based stroke intervention, however, it primarily addressed depression and General Anxiety Disorder, not focusing on sexual health. The article by Yasmin & Riley (2020) focused exclusively on the partner's sexual health, overlooking the sexual health of both the couple and the stroke survivor. Stratton et al., (2020) paper was a Literature Review and was therefore excluded since it's not considered original literature and thus did not meet the inclusion criteria. After full-text screening, seven articles were excluded, leading to the final inclusion of five studies that met the eligibility criteria for the review.

2. Study characteristics

The final studies had different designs, participant demographics, intervention methodologies and aims as shown in Table 1.

Table 1.*Study characteristics of the five studies included in the systematic review*

Study	Study design	Sample Size (n) Mean age (SD) Sex(n)	Intervention	Outcome Measure	Analysis Type	Main Findings	Risk of Bias
Meesters et al., 2020 Netherlands	Cross-sectional study	Total (n = 62) Age 55.4 (±7 11.0) Male (n = 33) Female (n = 29)	Sexual and Relational Counseling	ESF-M ESF-W SF-12 HADS MMQ-rs	Descriptive statistics Spearman correlation coefficients	<p>Patients exhibited a high level of relational satisfaction, the MMQ-score for relational satisfaction was 12.0 (IQR 4.3–23.5)</p> <p>There was a moderate positive correlation (rs=0.35, p = 0.02) between relational and sexual satisfaction, higher mental HRQoL (rs = 0.34, p = 0.03), less anxiety (rs = 0.34, p = 0.02) and less depressive symptoms (rs = 0.36, p = 0.02).</p> <p>For male participants, relational satisfaction was highly correlated with reduced symptoms of anxiety (rs = 0.54, p = 0.01) and depression (rs = 0.71, p = 0.00).</p> <p>A significant portion of the participants (54%) was not satisfied with their sex lives, with 63% of males and 44% of females reporting being (very) unsatisfied.</p>	High (JBI-CACS)
Ng et al., 2017 Australia	Randomised controlled trial	Total (n = 68) Age 63.3 (± 17) Male (n= 39) Female (n= 29)	<p>PLISSIT</p> <p>Intervention group:30-min individualized sexual rehabilitation programme, offer of a more comprehensive intervention subsequently and written educational material</p> <p>Control group: Written educational material</p>	CSFQ-14 DASS FIM SAQOL-39g	Mann-Whitney U Tests	<p>There was no difference between groups for any outcome measures, only the CSFQ Arousal subscale showed a significant improvement in the control group (p=0.027) with a moderate effect size (r = 0.3). The written information was as effective as the 30-min individualized sexual rehabilitation programme in improving sexual functioning, psychological coping, and quality of life in both the short term (6 weeks) and medium term (6 months).</p>	Some concerns (RoB 2)

Table 1. continued

Study	Study design	Sample Size (n) Mean age (SD) Sex(n)	Intervention	Outcome Measure	Analysis Type	Main Findings	Risk of Bias
Sansom, J. et al., 2015, Australia	Pilot randomized controlled trial	Total:12 Stroke patients: 10 Partners: 2 Stroke patients age: 64.8±20.6 Partners age: 62.5±23.3 Male stroke patients (n=5) Female stroke patients (n=5)	PLISSIT Intervention group:30-minute session in the inpatient and/or outpatient setting and written educational material Control group: Written educational material	CSFQ-14 DASS FIM SAQOL-39	Descriptive Analyses Mann-Whitney U test Outcome measures were reported by median and interquartile range (IQR).	There was no significant difference between the intervention and control groups at six weeks after the programme (T2) in sexual functioning (CSFQ-14), psychological functioning (DASS) and quality of life (SAQOL-39g) Both groups seem to present a trend towards improvement in sexual and psychological functioning, functional independence, and quality of life at T2	High (RoB 2)
Song et al., 2011, South Korea	Nonequivalent control group pre post-test	Total: 46 Stroke patients: 23 Spouses:23 Age: 57.89 (± 6.59); Male (n=19), Female (n=4)	Psychoeducational Intervention group: 40–50 minutes presentation and a 35 page booklet about sexual health, in general and after stroke Control group: Nothing	SBIQ-K DSFI McCabe & Taleporos (2003) questionnaire MMSE-K BADL-K	Descriptive Analysis ANCOVA Mann-Whitney U Test Fisher's Exact Test	The sexual rehabilitation intervention program significantly increased sexual satisfaction (Z = -2.29, p = 0.022) and frequency of sexual activity (F = 14.77, p > 0.001), but that it did not promote sexual knowledge (Z = -1.19, p = 0.24)	Serious (ROBINS-I)

Table 1. continued

Study	Study design	Sample Size (n) Mean age (SD) Sex(n)	Intervention	Outcome Measure	Analysis Type	Main Findings	Risk of Bias
Thomas, H., 2016, USA	Case report	Single case study: Mrs M, 69-year-old Hispanic woman	PLISSIT Occupational therapy sessions for 5 weeks, once a week.	COPM QSF SIS	Pre and post intervention outcomes comparison	There were significant changes in sexual activity, satisfaction, and perceived quality of life. The couple's COPM overall scores for intimate activities increased (from 4/20 to 11/20), with the performance subscale improving from 1/10 to 5/10 and the satisfaction subscale from 3/10 to 6/10. Additionally, the QSF scale displayed a 36% improvement, shifting from 96/160 to 61/160, reflecting enhanced sexual activity and a better self-perception of sexual dysfunction.	NA

Note. BADL-K: Basic Activities of Daily Living (Korean version);COPM: Canadian Occupational Performance Measure;CSFQ-14: Changes in Sexual Functioning Questionnaire-14;DASS: Depression Anxiety Stress Scales; DSFI: Derogatis Sexual Functioning Inventory; ESF-M and ESF-W: Eleven Questions about Sexual Functioning (for men and women respectively); FIM: Functional Independence Measure; HADS: Hospital Anxiety and Depression Scale; McCabe & Taleporos (2003) questionnaire: McCabe and Taleporos 6 item, 5 point sexual frequency scale; MMQ-rs: Subscale relation satisfaction of the Maudsley Marital Questionnaire; MMSE-K: Mini-Mental State Examination-Korean version; NA: Not applicable; QSF: Quality of Sexual Function Scale; SAQOL-39: Stroke and Aphasia Quality of Life scale-3; SAQOL-39g: Stroke and Aphasia Quality of Life scale-39 generic; SBIQ-K: Korean version of the Sexual Beliefs and Information Questionnaire; SF-12: Short Form 12-item Health Survey; SIS: Stroke Impact Scale.

Two studies were conducted in Australia (Ng et al., 2017; Sansom, et al., 2015), one study was conducted in South Korea (Song et al., 2011), one in the Netherlands (Meesters et al., 2020) and the USA (Thomas, 2016). Notably, there was an absence of studies from both African and South American regions. Regarding participant demographics, a consistent trend was observed across the studies. The average age of participants generally spanned between 50 and 60 years. Gender representation was relatively balanced, though there was a lower representation of women. A more in-depth analysis would be beneficial for a conclusive interpretation of this aspect. Across the board, the number of participants in these studies varied, ranging from 1 to 102.

Among the intervention studies, two were randomized controlled trials, a nonequivalent control group pre-test/post-test, a cross-sectional study, and a case report. Three studies reported structured sexual rehabilitation programs, one that tested the long-term impact of a specific intervention and a case of interdisciplinary sexual rehabilitation. Most interventions were based on the PLISSIT model and/with psychoeducational supplements, and one was Sexual and Relational Counseling.

3. Risk of bias

The results of the risk of bias assessments of the included studies are presented in Table 2. In the RCT conducted by Ng et al. (2017), there was a noticeable concern regarding bias from the randomization process and deviations from intended interventions. Missing outcome data, measurement of the outcome, and selection of the reported result exhibited a low risk of bias, but the overall risk remained significant. The Pilot Randomized Controlled Trial by Sansom et al. (2015) displayed a high overall risk of bias, particularly in the areas of randomization and deviations from intended interventions. Notably, the risk was low in missing outcome data, but high in outcome measurement and selection of reported results. Song et al.'s (2011) Cross-Sectional Study highlighted serious concerns regarding generalizability. Recall bias and the inability to establish causation were specific pitfalls. While there were low biases in areas like reported result selection, participant selection, and intervention classification, biases due to confounding were notably serious. The Nonequivalent Control Group Pre-Post-Test design exhibited clear bias, mainly from a lack of random assignment. This resulted in potential selection bias. Furthermore, the design lacked clear criteria for inclusion, reliable exposure measurement, and strategies for

Table 2.*Risk of bias assessment for each study*

RCT								
First author, year	Risk of bias arising from the randomization process	Risk of bias due to deviations from the intended interventions			Missing outcome data	Risk of bias in measurement of the outcome		Risk of bias in selection of the reported result
Sansom et al., 2015	High	High			Low	High		Some concerns
Ng et al., 2017	Some concerns	Low			Some concerns	Low		Low
Non RCT								
First author, year	Bias in selection of the reported result	Bias in measurement of outcomes	Bias due to missing data	Bias due to deviations from intended interventions	Bias in selection of participants into the study	Bias in classification of interventions	Bias due to confounding	
Song et al., 2011	Low	Moderate	Low	NI	Low	Low	Serious	
Cross-sectional study								
First author, year	Criteria for inclusion in the sample clearly defined?	Were the study subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?
Meesters et al., 2020	No	Yes	No	Yes	No	No	No	No

addressing confounders. Moreover, the employed statistical analysis was deemed inappropriate.

In Thomas (2016) Case Report, the design may naturally present potential challenges in extrapolating findings beyond the scope of the individual case. Being based on a single instance, the findings may not necessarily represent a wider population, suggesting potential bias in the selection of reported results. Additionally, since outcomes were largely self-reported by the patient and her spouse, this approach might introduce potential biases such as memory lapses or the influence of personal perceptions on recollections. The absence of a control group in this study raises concerns, suggesting that it could be challenging to definitively attribute the observed improvements solely to the detailed interventions. The focus on one patient signals a potential risk of selection bias as her experiences might not encompass the broader experiences of all geriatric stroke survivors. Furthermore, possible confounding factors were not identified and assessed.

4. Individual Studies Characteristics

4.1. Meesters et al., 2020 - "Counselled Patients with Stroke Still Experience Sexual and Relational Problems 1–5 Years After Stroke Rehabilitation"

Meesters and colleagues (2020) explored the effectiveness of sexual counselling as an integral part of a rehabilitation program for stroke patients. Their study examined patient's long-term sexual and relational satisfaction, spanning from one to five years post-discharge. The study was conducted between January 2010 and January 2014 in the Basalt Rehabilitation Centre, located in The Hague, Netherlands and used a cross-sectional survey design and focused on patients who had undergone at least two consultations with a sexologist.

The intervention primarily focused on relational and sexual counselling provided at the rehabilitation center, with a significant emphasis on intimate relationships and overall sexual health. The counselling approach was inspired from a classification of disability-related sexual health problems developed by (Pieters et al., 2018). This method proposes a multidisciplinary training intervention designed for rehabilitation professionals to optimize their expertise in addressing sexual health care.

The counselling was administered by two sexologists and typically offered to individual patients. However, when deemed necessary or appropriate, sessions were conducted jointly with their partners.

Of the 296 eligible patients, 63 (21%) provided informed consent, with 62 completing the necessary questionnaires. Data was extracted both from medical records—capturing details like age, diagnosis and duration since the stroke—and from the questionnaires. These questionnaires gathered sociodemographic information and evaluated various metrics like sexual functioning (using the Eleven Questions about Sexual Functioning), relational satisfaction (utilizing the Maudsley Marital Questionnaire), health-related quality of life (through the Short Form-12, specifically the Physical Component Summary (PCS) and the Mental Component Summary (MCS)) and overall mood (assessed using the Hospital Anxiety and Depression Scale).

Descriptive statistics provided a comprehensive overview of the participants' sociodemographic, clinical, sexual, and relational health. Notably, after experiencing a stroke, men reported a higher frequency of sexual fantasies than women. However, both genders showed comparable patterns in terms of masturbation, intimacy desire, and overall sexual activities. Among male participants, 80% encountered challenges with erectile function, with 93% reporting issues maintaining their erection. On the other hand, 52% of female participants experienced lubrication difficulties, and about a third highlighted genital discomfort. Despite these sexual challenges, orgasms during intercourse were still experienced by 17% of men and 39% of women. Yet, a significant proportion of participants, 63% of males and 44% of females, reported sexual dissatisfaction. This disparity was observed even though the median MMQ score pointed to a general sense of relational contentment. A strong correlation was identified between relational satisfaction and both sexual contentment and mental health. For women, there was a positive relationship between sexual, relational satisfaction, and mental well-being and for men better sexual satisfaction was linked to lower depression rates. Moreover, the SF-12 survey results revealed that participants' mental health quality was below the average of the general population. This was further reinforced by elevated depression (mean HADS-D score of 7.0) and anxiety levels (mean HADS-A score of 6.6), with 34% exhibiting signs of anxiety and 40% displaying symptoms of depression. Additionally, the results underscored a connection between relational satisfaction, sexual contentment, and mental health. The SF-12 results showed that

the mental component of health-related quality of life was below the general population's average.

Considering the evident post-stroke challenges that persist, the importance of continuous sexual health monitoring becomes clear in this study. The research also underscores the need for tailored interventions, considering the unique challenges and needs of post-stroke patients, even after a long period of time.

4.2. Ng et al., 2017 - Effectiveness of a Structured Sexual Rehabilitation Programme Following Stroke: A Randomized Controlled Trial

Ng and colleagues (2017) compared the effects of a structured program and written information to patients. The study spanned from February 2014 to April 2015, located in the inpatient rehabilitation setup of the Royal Melbourne Hospital, Australia. From the cohort of 68 participants, a division was clear. Thirty-five were exposed to a 30-minute session, based on the PLISSIT model, under the guidance of two rehabilitation physicians. In contrast, the remainder were provided with an informational factsheet.

The CSFQ-14 was used to assess current sexual behavior, the DASS for emotional states, the FIM for functional independence, and SAQOL-39g for an overarching view of the quality of life after a stroke. These evaluations were timed at baseline, the six-week mark and six months post-intervention. An interesting fact was that 79.4% flagged sexual dysfunction right at the beginning. However, approximately 50% identified their sexuality as an area of concern. Regarding their preferred mode of information dissemination, participants were evenly divided: 50% expressed a preference for written material, while the remaining 50% favored face-to-face communication.

The efficacy of written guidance equaled that of the 30-minute counselling session, especially during the initial post-stroke phase. Yet, at the six-month evaluation, the group primarily provided with written directives demonstrated a noticeable improvement in their arousal metrics.

In conclusion, the research by Ng and colleagues (2017) revealed that the initial post-stroke recovery phase, ranging from six weeks to six months, may be effectively addressed with only written guidance.

4.3. Sansom et al., 2015 - Let's talk about sex: A pilot randomized controlled trial of a structured sexual rehabilitation programme in an Australian stroke cohort.

Sansom et al. (2015) conducted a study to investigate the impact of a sexual rehabilitation program on post-stroke sexual health in the inpatient rehabilitation unit at the Royal Melbourne Hospital. The research examined sexual functionality, psychological well-being, and the overall quality of life following a stroke. The sexual rehabilitation intervention was administered in a single 30-minute session, accessible for both inpatients and outpatients; when conditions allowed, the sexual partners of participants were integrated into these sessions, providing a comprehensive approach to the rehabilitation.

From a methodological perspective, the study used a sample of 12 participants at baseline (T1). Seven of these constituted the control group and received a fact sheet on post-stroke sexuality developed by the NSF. The remaining five participants were designated to the intervention group, which was provided not only with the fact sheet but also underwent a PLISSIT-based intervention. This individual-focused intervention consisted of a 30-minute session, led by a recognized rehabilitation physician, and supported by contributions from occupational therapists, physiotherapists and/or psychologists. CSFQ-14, DASS, FIM and SAQOL-30 were used to assess sexual behavior of participants, negative emotional states of depression, anxiety, and stress, functional ability and need for assistance and quality of life.

The results of the study illustrated diverse responses. While 42% of the participants did not regard sexuality as crucial post-stroke, a contrasting 58% emphasized its importance in their recovery process. One-third of this latter group expressed a strong preference for direct consultations with physicians. At six weeks post-intervention (T2), no significant differences between the groups were observed in terms of sexual functionality (CSFQ 14), psychological well-being (DASS) or quality of life (SAQOL 39g). Yet, a positive trend from T1 to T2 was evident across all measures.

In summary, this research underscores the potential benefits of sexual rehabilitation following a stroke, emphasizing its role in improving sexual and psychological well-being, as well as overall quality of life. Notably, the method of delivery, whether through individualized sessions or written materials, did not significantly influence the effectiveness of the results.

4.4. Song et al., 2011 - Effects of a Sexual Rehabilitation Intervention Program on Stroke Patients and Their Spouses.

Song and colleagues (2011) conducted a study to assess the effectiveness of a sexual rehabilitation program specifically designed for stroke patients and their partners. The main objectives centered on increasing sexual knowledge, sexual satisfaction, and the frequency of post-stroke sexual activity. The sample consisted of 46 participants, 23 stroke patients, and their 23 respective spouses. It is noteworthy that male stroke patients represented a substantial 82.6% of this group. The average age of the participants was approximately 57.89 years. Outcomes were measured in terms of sexual knowledge, as assessed by the Sexual Beliefs and Information Questionnaire; sexual satisfaction, as determined by the Derogatis Sexual Functioning Inventory; and an overall assessment of the frequency of sexual activities.

When accessed 1-month post-intervention no significant results were found between groups on sexual knowledge. The intervention's effect was significant for sexual satisfaction and frequency of sexual activity. The experimental group (23.63 ± 8.20) recorded a score substantially higher than the control group's (6.23 ± 11.82) for sexual satisfaction. Similarly, the experimental group reported sexual activity frequencies of ($4.29 \pm 2.53/\text{month}$), superior than the control group ($1.86 \pm 1.61/\text{month}$).

In conclusion, though there was little change in the domain of sexual knowledge, the sexual rehabilitation program demonstrated efficacy, significantly enhancing both sexual satisfaction and activity frequency among post-stroke patients and their partners.

4.5. Thomas, 2016 - Sexual Function After Stroke: A Comprehensive Rehabilitation Intervention with a Geriatric Survivor

Thomas (2016) presented a case report examining the post-stroke sexual complications encountered by a 69-year-old Hispanic female, and her long-term partner of 45 years. The report illustrated a specialized intervention based on the PLISSIT model, employing an integrated interdisciplinary approach that spanned various therapeutic domains. The patient participated in weekly occupational therapy sessions over a period of five weeks. This regimen was part of a broader program that also encompassed input from speech and physical therapy, psychological counselling, and medical consultations. The

primary goal was to address the post-stroke physical and cognitive challenges faced by the patient, with a particular focus on enhancing sexual health.

Assessment tools included the Canadian Occupational Performance Measure (COPM), which observed a substantial 175% increase in intimate activities; the Stroke Impact Scale (SIS), effective for the early detection of functional impairments such as bladder control but with limited results evaluating sexual changes; and the Quality of Sexual Function Scale (QSF), which depicted an improvement of 36%, displaying a significant progress in the client and partner perspectives of their sexual activity and sexual satisfaction.

Nevertheless, this case underscores the critical importance of a collaborative rehabilitation team in the recovery process of patients. It also exemplifies the potential benefits of combining outcome measures with integrated strategies, all aimed at enhancing the quality of life for stroke survivors.

Discussion

1. Interpretation of results

The current study aimed to find the main non-pharmacological interventions addressing the sexual health of stroke survivors documented in the literature, and possibly tapering on digital interventions and their characteristics. Regarding our first objective, we found five articles that met our criteria, which was reflective of the lack of studies in the area, a problem highlighted in previous reviews (Auger et al., 2021; Grenier-Genest et al., 2017; Stratton et al., 2020). Regarding the characteristics of digital interventions in the field of sexual rehabilitation for stroke patients, the literature presented no results.

The most prominent form of intervention was the PLISSIT model (Annon, 1976), namely on the Sansom et al. (2015) framework for the intervention, as well as the case report of Thomas et al. (2016). Even though Song et al. (2011) intervention was not PLISSIT-based, it still presented similarities since the revised program consisted in providing information on common sexual problems and major causes of changes in sexual life after stroke; providing general information regarding a healthy sexual life; counselling on fears regarding post-stroke sexual life; introducing tips and specific strategies to minimize poststroke sexual dysfunction; and presenting frequently asked questions and answers regarding post-stroke sexuality. Ng and colleagues (2017) built their intervention drawing inspiration from both Song's revised program and the PLISSIT model.

Multiple studies have highlighted the active involvement of spouses or partners in the rehabilitation process (Sansom et al., 2015; Song et al., 2011; Thomas, 2016), but the remaining studies also integrated partners. Meesters et al (2020) suggests that partners could join the counselling when deemed appropriate, and Ng et al. (2017) noted that, while attendance was an option, there was no adherence on the part of the partners. This emphasizes the collective nature of sexual health and recovery and the importance of mutual understanding and adaptation (McGrath et al., 2019).

Different tools and scales were used in the studies, but they were all aimed to measure similar constructs. All studies had some focus on sexual functionality and satisfaction as well for participants quality of life and/or functional abilities after a stroke. Except for Song (2011), the remaining studies aimed to evaluate the mood, emotional and psychological states of participants, focusing on areas such as anxiety, depression, and stress.

The studies consistently showed a trajectory of improvement in the quality of life and functional abilities, emphasizing the positive outcomes of sexual rehabilitation not just on sexual health but on overall life satisfaction and functionality. Out of the two RCTs analyzed, neither of them found overall differences between the intervention group and control group results. There seems to exist a trend towards improvement on both RCTs for all the outcome measures, which may suggest that sexual health post-stroke is effectively addressed with only written guidance. Song et al. (2011) might put this conclusion in perspective since it did not detect a significant change in sexual knowledge, indicating that knowledge might not directly translate to satisfaction; in this case, the improvements in sexual health may not have been due to written guidance, and request confounding control.

The counselling approach in Meesters et al. (2020) demonstrated that, despite counselling, a substantial number of stroke survivors continued to experience sexual challenges. This suggests that counselling might require additional interventions. This is supported by the case study from Thomas (2016), which indicates that a holistic, interprofessional approach can lead to significant improvements in both sexual satisfaction and functional ability. This highlights the potential advantages of an integrated, multifaceted rehabilitation strategy.

2. Study limitations

The studies under review, spanning from cross-sectional to randomized controlled trials, present a heterogeneous methodological landscape. Notable shortcomings were observed: there is a scarcity of research, many studies exhibit heteronormative biases, the methodological rigor in some investigations is lacking, and inclusion of patients with dysphasia presents a significant challenge, potentially skewing results given their representation in the stroke population.

All the studies presented valuable insights into post-stroke interventions but faced challenges and limitations. These include small sample sizes, institution-specific constraints, the short-term nature of interventions, potential biases, and individualized case results. Meesters et al. (2020) highlighted issues with a one-time questionnaire and non-validated outcomes measures (ESF). Ng et al. (2017) relied heavily on a single 30-minute session with only two physicians, raising potential oversight and bias concerns. Samson et al. (2015) and Song et al. (2011) research also faced concerns about generalizability due to their focused settings and sample sizes. Thomas' study, while promising, is a specific case and thus less widely applicable. Collectively, these findings underscore the need for broader, longitudinal research. The range of results suggests that personalized interventions, tailored to individual needs, may be more effective than a generic approach. Additionally, the similarities between intervention and control groups in some studies point towards possible inherent biases given the absence of controls for confounding variables.

Another limitation is the ambiguity surrounding the current psychological theories in the interventions of the studies. The PLISSIT model is a learning-oriented behavioral approach to treatment (Annon, 1976). It provides a framework for distinguishing and addressing problems that can be managed with brief therapy approaches from those that require intensive therapy. Nevertheless, while the PLISSIT model itself is grounded in a learning-oriented behavioral approach, it is not incompatible with other theoretical orientations, as stated by Annon (1976): “This paper does not intend to convince professionals from any orientation to adopt a learning-oriented approach. It's expected that clinicians will use only those suggestions that align with their perspectives, but there's hope that they might be open to some experimentation.”. This implies that the theoretical psychological foundation of the interventions, beyond the PLISSIT model, remains largely undefined.

Lastly, this review's restriction to studies published in English may lead to potentially missing out on relevant findings published in other languages. Moreover, the exclusion of grey literature could have also contributed to the reduced number of records included in this review.

3. Study implications

These review findings underscore the need for a holistic, integrated approach to post-stroke sexual rehabilitation in clinical practice. Beyond the clear focus on sexual functionality, it's evident that emotional, psychological, and relational factors play a vital role in a patient's recovery trajectory (Hall, 2013). Many studies explicitly emphasized the importance of not just the individual's recovery but also of those surrounding them, stating the instrumental role of spouses or partners in the rehabilitation process (Korpelainen et al., 1999; Smith et al., 2012). Clinicians, based on these findings, should consider routinely integrating partners into rehabilitation discussions and interventions. Given the diverse outcomes across the reviewed studies, it's becoming abundantly clear that a standardized, one-size-fits-all approach may not be the best approach for all stroke survivors (McGrath et al., 2019; Thomas, 2016). Clinicians should strive for interventions tailored to the individual needs of stroke survivors and their partners.

The current research landscape offers valuable insights into post-stroke sexual rehabilitation. However, it also underscores pronounced gaps in studies about post-stroke sexual interventions, particularly in the digital domain. Despite the growing importance of Telemedicine and e-Health (Smith et al., 2012), studies addressing the sexual health of stroke survivors in this realm remain notably sparse. Future research should aim to address these gaps, broadening the scope and depth of our understanding in this area. A consistent theme emerging from this review is the methodological variance across studies. To aid the reliability and generalizability of findings, future investigations should prioritize larger sample sizes, adopt longitudinal study designs and ensure rigorous controls for potential confounding variables. While the PLISSIT model provides a strong foundation, incorporating diverse psychological theories can offer a richer and more comprehensive perspective (Hall, 2013). Furthermore, future studies should aim to avoid biases, such as heteronormativity, and consider the unique needs and challenges of diverse populations, including those with dysphasia.

Shifting focus towards the domain of policy and guidelines, there is a pressing need for healthcare institutions to establish standardized guidelines for post-stroke sexual rehabilitation (Mellor et al., 2013). Creation of standardized guidelines, yet flexible enough to cater to individual nuances, should be the priority. The emergence and growth of telemedicine underscore an opportune moment for policymakers to emphasize research in

digital interventions tailored to this niche. To ensure effective clinical implementation, there's a clear need for clinicians to receive ongoing training and development in post-stroke sexual rehabilitation, updated knowledge ensures that patients receive the best care possible. (Mellor et al., 2013)

Conclusion

In conclusion, the findings of this review, along with its highlighted gaps, underscore the intricate nature of post-stroke sexual rehabilitation and emphasize the importance of a multifaceted, holistic, and tailored approach to treatment. Although the available literature points to the existence of benefits from psychotherapeutic interventions in promoting the sexual health of stroke survivors, the data showed differences in the degree of this efficacy, even among those based on the PLISSIT model. The review also highlighted the scarcity of studies about non-pharmacological interventions, confirming concerns raised by previous reviews. Likewise, the evident gap in digital interventions, despite their increasing relevance in today's healthcare landscape, underscores an area ripe for innovation. The implications drawn from our research offer a roadmap for future investigation, clinical practices, and policymaking, aiming to optimize the well-being and quality of life of stroke survivors. It is appropriate to note that the conclusions drawn from this review should be interpreted with caution given the prevalent high risk of bias in the included studies.

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Appendix

Search strategy

- (online OR digital) AND (intervention OR program OR treatment OR therapy) AND (“sexual health” OR sexuality OR “sexual function” OR "sexual wellbeing" OR “sexual activity” OR “sexual satisfaction” OR intimacy) AND stroke
- (mobile OR tele*) AND (intervention OR program OR treatment OR therapy) AND (“sexual health” OR sexuality OR “sexual function” OR "sexual wellbeing" OR “sexual activity” OR “sexual satisfaction” OR intimacy) AND stroke

- (internet OR web) AND (intervention OR program OR treatment OR therapy) AND (“sexual health” OR sexuality OR “sexual function" OR "sexual wellbeing" OR “sexual activity” OR “sexual satisfaction” OR intimacy) AND stroke
- (intervention OR program OR treatment OR therapy) AND (intervention OR program OR treatment OR therapy) AND (“sexual health” OR sexuality OR “sexual function" OR "sexual wellbeing" OR “sexual activity” OR “sexual satisfaction” OR intimacy) AND stroke