IOSR Journal Of Humanities And Social Science (IOSR-JHSS)
Volume 29, Issue 8, Series 9 (August, 2024) 01-10
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Impact Of Resistance Exercises On Urinary Incontinence: A Systematic Review

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Abstract
Introduction*: Urinary incontinence (UI), defined by the International Continence Society (ICS) as the "complaint of any involuntary loss of urine", is a condition that negatively impacts the quality of life of millions of people. Among the various treatment modalities, resistance exercises have emerged as a promising intervention, especially due to their low cost and effectiveness in improving muscle function. But health professionals, especially Physical Education teachers, face difficulties when systematizing a resistance training protocol*.
Materials and methods*: This systematic review aimed to examine studies published between 2014 and 2024 to evaluate the impact of resistance exercises on urinary incontinence, focusing on different types of incontinence, target populations and exercise protocols.*
Results*: The results showed that resistance exercise programs are effective in improving health and reducing urinary incontinence, highlighting the importance of a personalized approach that considers factors such as parity, surgical procedures, sedentary lifestyle and obesity.*
Conclusion: *The impact that resistance exercises can have, whether positive or negative, depends on the strategic capacity of each professional involved in developing the protocol. Success is only possible when knowledge becomes an ally, consciously emerging as a fundamental force that will ensure adherence to the exercise protocol. Furthermore, in addition to significant improvements, exercise in general should be practiced on a daily basis, as it is the best remedy for preventing diseases and muscle dysfunctions*.
Key words*: Urinary incontinence; quality of life; resistance exercise; treatment*.

Date of Submission: 19-08-2024 Date of Acceptance: 29-08-2024

I. Introduction

Urinary incontinence is a debilitating condition that affects the quality of life of millions of people around the world. According to the International Continence Society (ICS), urinary incontinence is defined as "the complaint of any involuntary loss of urine". This condition can vary in severity and negatively impact the daily life, self-esteem and mental health of affected individuals.

Although there are various treatment modalities available, such as behavioral, drug and surgical therapies, non-pharmacological interventions have received increasing attention due to their effectiveness and low cost. Among these interventions, resistance exercises have aroused interest as a promising approach to the management of urinary incontinence.

Resistance exercises, also known as resistance training or muscle strengthening, have been recognized for their benefits in improving muscle function and promoting physical health. In the context of urinary incontinence, studies have investigated the role of these exercises, especially in the pelvic floor muscles, in reducing symptoms and improving patients' quality of life.

According to Okeahialam, N. A., et al. (2022), "muscle strengthening training, including resistance exercises, can play an important role in reducing urinary incontinence by strengthening the pelvic floor muscles and improving bladder support". This approach has been widely studied in different populations, including postpartum women, the elderly and patients undergoing treatment for prostate cancer.

However, despite the emerging evidence, there are still gaps in knowledge about the specific impact of resistance exercises on urinary incontinence, highlighting the need for a systematic review of the literature to synthesize the existing evidence and identify areas for future research.

Bodybuilding, gymnastics in general and sports training lack structured guidelines for practicing specific physical exercises to prevent urinary incontinence (Caetano, Suzuki and Moraes, 2019). The lack of structured guidance can lead to insecurity, which can possibly result in the client withdrawing from physical exercise practices in the long term.

Therefore, the main objective of this systematic review is to critically examine the studies available between 2014 and 2024 to evaluate the impact of resistance exercises on urinary incontinence, providing a comprehensive and up-to-date understanding of the state of the art in this field.

II. Material And Methods

This is a systematic review study, following the recommendations of the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) method, established in four stages: 1) Identification; 2) Screening; 3) Evaluation; 4) Inclusion. The databases used were *Pubmed*, *Scielo* and Biblioteca Virtual de Saúde (BVS), considering studies carried out between 2014 and 2024.

In order to find descriptors that would result in the best selection of articles, the Descriptors in Health Sciences (DeCS) were used as a systematic search strategy in the databases. The following descriptors were used in Portuguese and English: "resistance exercise OR urinary incontinence AND treatment AND brazil" in PubMed and "resistance exercise OR urinary incontinence AND treatment AND Brazil" in BVS and Scielo.

The inclusion criteria for selecting the studies were: complete scientific articles available in full, published between 2014 and 2024, which directly addressed the impact of resistance exercises on urinary incontinence. Materials that did not fit these criteria were excluded, as were studies that were not aligned with the specific theme of this research.

III. Results And Discussion

Of the studies found, the final sample consisted of articles that met all the inclusion criteria used to validate the studies in the literature search process. The articles included were from different journals and are specified according to title and main objective (Chart 1).

Articles selected for the study, including year and author, sample, actions taken, evaluation methods and results.

IV. Results

Table 1 - Summary of studies selected for the systematic review on the impact of resistance exercises on urinary incontinence:

Author	Sample	Actions taken	Evaluation methods	Results
Fernandes and Neto (2021)	Class sizes in Unit 1 ranged from 6 to 27 users; in Unit 2, from 28 to 45.	The classes followed the CAP protocols, divided into two main parts: the first half involves motivational activities such as dancing and aerobic practices, while the second half focuses on strength exercises using weights, shin guards, poles etc., focused on the upper and lower limbs.	Participant observation; interviews with semi-structured questionnaires; protocol on the perspective of subjectivation in Michel Foucault.	The text highlights the presence of both the traditional approach to health care, centered on physical activity, and other body practices adopted by users. These different approaches contribute to a dual and interconnected vision of health care actions, combining body practices and physical activity. The inclusion of a variety of body practices, beyond those traditionally accepted, suggests greater integration with local culture, including games, folk dances and games. This broadens the understanding of human dimensions beyond the biomedical aspect and highlights the importance of greater interaction between Primary Health Care and the local context.
Nakamura *et al.*, (2015)	440 participants (409 women with an average age of 50 ± 26 years and 3 men with an average age of 64 ± 10 years).	Over the 10-year period, the PEHPCP intervention consisted of fortnightly 60-minute sessions of aerobic, muscle-strengthening, flexibility, coordination, balance and agility exercises. Each session was divided into 3 parts: (1) a warm-up exercise (10 min), which included exercises for the main muscle groups; (2) the main part of the session (40 min), which included exercises to improve aerobic	*Physical* fitness assessment tests 3 times a year, AAPHERD (*American Alliance for Health, Physical Education, Recreation and dance*): flexibility, agility, dynamic balance, coordination, muscular strength and aerobic endurance.	At the end of All the physical fitness variables (motor coordination, agility and muscle strength) showed a significant improvement for participants aged ≥ 70 years, except for aerobic capacity and flexibility. Aerobic capacity, flexibility and agility showed a significant difference in terms of gender (men) ($p \leq 0.05$).

		capacity (30 min) and exercises for muscle strengthening, flexibility, coordination, balance and agility (10 min); and (3) the final part (10 min), which included stretching exercises.		
Lin Lyu et al., (2021)	32 middle-aged women, subdivided into two groups; (1) Internal Resistance Training Group - IMT (n=16); (2) Pelvic Floor Muscle Training Group - PFMT (n=16).	A home program was carried out with both groups. The TMI group performed cocontraction training of the transverse abdominal muscle and pelvic floor muscles, with the addition of lateral resistance on both knees by means of a Thera-band (elastic band), and were prescribed two sets of 20 repetitions of a 5-second cocontraction. The TMAP group performed 2 sets of 20 repetitions of a 5-second contraction. They were instructed to perform an exercise session 3 times a week, and the intervention lasted 8 weeks.	All participants completed a questionnaire on UI, birth history, method of delivery and menstrual cycle. The thickness of the transverse abdominal muscle (TA) was measured by ultrasound. MTA thickness was measured in all participants in the supine position under eight randomized conditions.	A significant improvement was observed in middle-aged women with stress urinary incontinence. The study highlights that training exercises for the internal muscles were more effective when compared to isolated exercises for the pelvic floor muscles, and that greater recruitment of muscle fibers was observed at the end of the study. Both protocols obtained significant results.
Cross et al., (2023)	The sample consisted of: **(1)** the **Resistance Training (RT) group**, made up of 14 women and; **(2) the RT** + Kegel **group**, made up of 19 women. **Total of 33.**	Stretching and warm-up activities were carried out before the start of each session. The TR program consisted of squats, deadlifts, incline push-ups and knee push-ups, and was based on the Powerlifting Australia Level 1 Powerlifting Coaching course. It was adapted for 2 days a week with a focus on squats and deadlifts. Each session lasted 1 hour, followed by 2 to 3 sets of low to moderate level, and the study lasted 12 weeks.	A physiotherapist carried out the initial assessment, where important data was collected such as obstetric/gynecological history, triggers for SUI, safety for inclusion in the RT program and verbal consent obtained for the vaginal examination of the pelvic floor. A consistent process using perineometry and digital palpation (awake) was used for all participants. IBM Statistical Package for the Social Sciences (SPSS) version 26 (New York, NY, USA) was used for statistical data analysis.	The authors concluded that over time, kegel exercises combined with RT achieved significant results, expressed in gains in muscle strength, a reduction in fat mass and a reduction in stress urinary incontinence. Adequate supervision proved to be extremely important for the results of the intervention, and the prescription of low and moderate intensity RT did not aggravate UI.
Pires et al., (2020)	**13** elite female volleyball players, aged 18 or over, nulliparous. They were divided into CG and SG.	Guidelines for performing pelvic floor muscle training daily at home, as well as extra training. This included physical training sessions lasting 16 weeks. During this period the training was subdivided into three phases: Awareness (at home), strength training (at home) and Power (in training). The King's Health Questionnaire (KHQ) was also applied.	The data was analyzed using IBM SPSS, version 24 for Windows statistics. Student's t-tests were used for independent samples (comparison between the CG and SG groups) and paired samples (comparison between the initial and final phases). ANOVA was used for repeated measures with two factors: time (initial phase and final phase) and group (CG and SG). The group-time interaction term was used to assess whether there were significant differences between the two groups in terms of the variation in perineometry and the pad test between the initial and final phases. The assumptions for using these tests were tested and validated using the Shapiro-Wilk test (normality of the data), Levene's test (homogeneity of variances) and the M Box test (homogeneity of the covariance matrix in ANOVA). A significance level of 5% was considered	The experimental group, who underwent pelvic floor muscle training protocols over a period of 16 weeks, showed a significant reduction in urine loss, from 71.4% to 42.9%. It was also found that maximum voluntary pelvic contractions improved ($p<0.001$). These results suggest that the training protocol can be effective in treating SUI in athletes and highlight the importance of having the awareness to perform maximum voluntary contractions of the pelvic floor muscles.

Wikander et al., (2022)	191 valid responses from competitive weightlifters.	Questionnaire to assess frequency and Incontinence Severity Index (IGI): Frequency (0 = never, 1 = less than once a month; 2 = 1 to several times a month; 3 = 1 to several times a week and; 4 = every day or night) and severity (1 = a few drops; 2 = a little and; 3 = more) of UI. Where the IGI score was determined by multiplying the frequency by the severity, subdividing them: 0 = continent, 1-2 = mild, 3-6 = moderate, 8-9 = severe and 12 = very severe. Also a pilot survey including open questions where some subjects chose to include feedback.	Data was collected using the Qualtrics platform (Qualtrics, Provo, Utah & Seattle, WA). Data were analyzed using the Statistical Package for the Social Sciences (SPSS 26.0 Inc, Chicago, IL), and central tendency and dispersion were reported as means ± SD. Descriptive data was calculated from the subjects' responses and presented in percentages and number of respondents. The relationship between common risk factors (age, BMI and parity) and exercise-specific risk factors and the IGI score was investigated using Pearson correlations. The significance level was set at $p \leq 0.05$ for all analyses.	Weightlifting exercise, seen from a sporting perspective, has been shown to be a potential risk factor for the incidence of urinary incontinence. The research indicates that the high intensity of the exercises, characterized by high loads and excessive repetitions, can overload the pelvic floor muscles. It is worth noting that in comparison with the Snatch, clean and jerk or pull exercises, the squat had the highest probability of causing urine leakage during its execution.
Bo et al., (2021)	143 inactive, overweight (BMI > 25) or obese (BMI > 30) women	12 weeks (3 sessions of 1 hour per week) of Bood Pump (55 min. sessions, 50 to 100 repetitions for each muscle group), unsupervised traditional strength training with a heavy load, traditional strength training with a heavy load with the help of a personal trainer (non-linear periodization, 3 to 15 repetitions and 2 to 4 sets) and a control group with no exercise. Before and after the intervention, the women answered a questionnaire on variables including educational level, physical activity, nutrition, smoking habits, perceived health, quality of life (QoL), motivation to exercise, musculoskeletal pain and UI (the activities were not aimed at the pelvic floor muscles or the treatment of UI).	The International Consensus Questionnaire on Urinary Incontinence Short Form (ICIQ-UI-SF) was used. The chi-square test or analysis of variance (ANOVA) was used to analyze the baseline variables. Adherence between the groups was analyzed using Tukey's post hoc test and the difference in adherence was analyzed using ANOVA.	The level of adherence among women was higher in the traditional resistance training group with personal trainer supervision than in the other modalities. The results of the study found that there was no statistically significant difference in the prevalence of UI at the beginning of the study or in the new onset of UI after 12 weeks of physical training among the women. In summary, the results suggest that traditional RT with supervision is a safe and effective option for physical health, without posing an additional risk for UTIs.
Fitz et al., (2019)	69 women with SUI were randomized into two groups: the outpatient TMAP group and the home TMAP group.	Both groups were encouraged to perform 3 sets of 10 repetitions a day for 3 months. A series consisted of 10 maximum voluntary contractions held for 6 to 10 seconds of the pelvic floor muscles (6 s. during the 1st month, 8 s. during the 2nd month, 10 s. during the 3rd month) with double rest time between each contraction, followed by three to five rapid contractions in a row (three contractions in the 1st month, four contractions in the 2nd month, five contractions in the 3rd month). The exercises were performed in the supine (1st month), seated (2nd month) and standing (3rd month) positions. Patients in both groups were assessed on a monthly basis as to the progression of the training and received an exercise	Pelvic floor muscle strength was assessed by digital palpation and quantified according to the Oxford Classification Scale. Quality of life was assessed using the Incontinence Quality of Life Questionnaire (I-QoL). The number of exercise sets completed was obtained from an exercise diary and recorded as the average number of exercise sets per month performed during the 3-month therapy for both groups. The protocol includes performing **three sets per day/7 days per week**. The number of episodes of involuntary leakage over 7 days was recorded in a home leakage diary. The 20-minute modified pad test was performed to quantify the severity of SUI.	The group that underwent pelvic floor muscle training in the outpatient clinic, under the supervision of the physiotherapist, obtained significantly better results than the group that did the exercises at home. This result emphasizes the value of the health professional in providing greater efficacy, safety and respect, as well as directing the patient to the next qualified professional who will continue with the progression of the treatment with new interventions. Both protocols have shown promise.

		diary. The protocol was carried out in accordance with the Consensus on Exercise Reporting Template (CERT).		
Araujo et al., (2021)	197 female athletes practicing CrossFit. Average age 32 years.	Research carried out during the COVID-19 quarantine in Brazil. The most commonly used exercises consisted of free bodyweight exercises: Air Squat, Push up and Burpee. There was an increase in the volume of training, but consequently a decrease in intensity.	Cross-sectional study that followed the guidelines of the Strengthening the Reporting of Observational Studies In Epidemiology Statemen t (STROBE). The participants signed an informed consent form before starting the online survey. After signing, a questionnaire was filled in and sent via the google forms platform. The questionnaire included demographic variables, variables related to CrossFit training, variables related to COVID-19 and urinary incontinence.	The study, which involved 197 participants, showed statistically significant data. During the quarantine period, the CrossFit athletes drastically reduced the intensity of their workouts, using only their own body weight, which was reflected in the decrease in urine loss during practice. One positive finding was that 98.5% maintained healthy lifestyle habits, exercising daily for at least 30 minutes. The most practiced exercises were free squats, push-ups, burpees and lunges.
Pires et al., (2020)	197 female athletes were analyzed. Aged between 18 and 45, they all practiced an average of 201.7 minutes per week of physical activity and strength training.	This is a cross-sectional observational study of Portuguese sportswomen. The most practiced sports were weight training (39.1%) and gymnastics (15.2%). A percentage of 51.3% performed low-impact activities, while 46.2% practiced high-impact activities and only 2.5% medium-impact activities.	Sociodemographic questionnaire; King's Health Questionnaire (KHQ) (to assess the impact of UI on women's quality of life, urinary symptoms and subjective measure of severity); Assessment by a physiotherapist to measure the ability to perform a correct contraction of the PFM. A manometer was used to measure the maximum voluntary contraction (MVC) and the varginal pressure at rest (PVR); Data analysis was carried out using the SPSS statistical analysis program, version 24 for Windows (IBM Corp, 2016). The variables were studied using absolute (n) and relative (%) frequencies (qualitative variables) and mean and standard deviation (quantitative variables). Pearson's correlation coefficient and Student's t-test were used to study the factors associated with QoL. Linear regression models were also used to study the factors influencing overall QoL and its domains. Values with $P \leq 0.05$ were considered statistically significant.	Physical exercise has long been considered the first-line intervention, and the higher the level of physical activity, the better a person's quality of life (also reflecting a reduction in SUI). The researchers observed that the majority of women reported a very good or good perception of QoL, while a very small percentage reported a negative perception. This negative perception may be correlated with the practice of high-impact physical exercise, increased body weight and advancing age, with the study itself presenting statistically significant data. Women who had higher levels of maximum voluntary contraction of the pelvic floor and more time practicing physical activity during the week had a better QoL.
Virtuoso; Menezes and Mazon (2019)	32 women, subdivided into two groups: (1) **Intervention Group** (n=14) (Resistance Training + Pelvic Floor Muscle Training); and (2) **Control Group** (n=18) (Pelvic Floor Muscle Training).	**Pelvic Floor Muscle Training:** 2 sessions per week, each session lasting 30 minutes. The exercises were performed in three positions: Lying down, sitting and standing. Each exercise comprised 12 repetitions of contraction of the pelvic floor muscles during exhalation. After 8 sessions, the "Krack" maneuver was implemented**. Resistance Training:** After the TMAP, the participants received the RT protocol. This consisted of twice a week, each session lasting 50 minutes, 3 sets of 15 RM with a 1-minute interval between sets. The protocol was divided into a familiarization stage, weight determination and training sessions. The intervention lasted 12	The International Consultation on Incontinence-Short Form (ICIQ-SF), adapted and validated for Brazil, was used to assess the impact of UI. Questionnaire-Short Form (ICIQ-SF) adapted and validated for Brazil was used to assess the impact of UI. To assess the severity of UI, an interview form was used containing questions about the duration of UI symptoms, daily pad use, number of pad changes during the day and night, and UI episodes. The data was analyzed descriptively. The Shapiro-Wilk test was used to assess the normality of the data. The TMAP was supervised by a physiotherapist and the TR was supervised by a professional in the field.	The extra stimulus provided by the study obtained interesting results when resistance training was combined with pelvic floor training, compared to pelvic floor training alone. After the first 4 weeks of training, an early reduction in UI symptoms was observed in the GI, mainly related to everyday situations such as sneezing, coughing and laughing. The study suggests that after a period of one month, a complete reduction in UI symptoms can be observed in the IG. In addition, both the control and intervention groups obtained positive results, but more research is needed on the subject.

		weeks.		
Wikander et al., (2021)	480 participants, all female weightlifters. Age range between 20 and 89 years.	Online cross-sectional survey developed based on feedback from a pilot study investigating the prevalence of UI in predominantly Australian female weight lifters. The survey included an open question where some participants chose to include comments and suggestions for future research. The focus of the questions consisted of the context in which circumstances UI occurs (daily activities, training or competition or both) and exercises most likely to provoke UI.	UI severity was measured using the **Incontinence Severity Index (ISI)**; an online survey tool (Qualtrics, Provo, Utah and Seattle, WA, USA) was used to collect data. The survey was disseminated via Facebook and emailed to intermediaries. The Statistical Package for the Social Sciences (SPSS 27.0 Inc., Chicago, IL) was used to analyze the data. Central tendency and dispersion were reported as means ± standard deviation (SD), and descriptive data were presented as percentages and absolute numbers. The relationship between risk factors and the ISI score was investigated using Kendall's tau-b with a significance level set at $p \leq 0.05$ for all analyses. The association between pelvic floor examination or confidence in performing a pelvic floor contraction with the ISI score was assessed using the Eta correlation coefficient, and the results were reported in η.	The data obtained showed that there are three factors that significantly affect the experience of UI in the competitive arena: high loads, irregular body position and pelvic floor muscle fatigue. The exercises most likely to cause UI were the deadlift, free squat, front squat and sumo deadlift. The use of accessories such as lifting straps adds a problem due to increased pressure in the abdominal area. These variables can be manipulated by a professional, systematizing the best choice of protocol to minimize the risks of urine leakage in the sports environment.
Virtuoso et al., (2016)	After a physiotherapy protocol, 4 women underwent a resistance training protocol. Age > 50 years.	**Resistance training (RT)** aimed at strengthening various muscle groups, including those close to the pelvic floor muscles (adductors, glutes and rectus abdominis). The RT lasted 12 weeks, with 3 sessions per week, lasting 40 to 50 minutes per session. Three sets of 15 RM were prescribed, with a 1-minute interval between sets. **The exercises performed:** Pectoral fly, horizontal leg press, closed front pull, adductor chair, triceps pulley, low poly thread and lying abdominal crunch. The protocol was based on studies by other authors.	Interview with sociodemographic questions. To check for urinary leakage, even after physiotherapy treatment, the Pad Test was applied; the PERFECT scheme was used, developed by Bø and Larseb in 1990, the aim of which is to quantify the intensity, duration and sustainability of perineal muscle contraction; to assess the physical abilities of the elderly women, the following tests were used, which are part of the Senior Fitness Test Battery - SFT (Rikli, & Jones, 2008): lower and upper limb strength; lower and upper limb flexibility; and agility and dynamic balance; For the anthropometric assessment (Body Mass Index, Waist Circumference and Hip Circumference), a Wind Plenna® digital scale (accuracy of 0 .1kg and maximum capacity of 200kg) was used to determine body weight and a Cardiomed® portable stadiometer to check height.	After physiotherapy treatment, resistance training has proved to be an effective tool in maintaining the continuity of urinary continence. The RT protocol not only kept continence levels stable, but also promoted positive results in terms of physical fitness gains, improved flexibility, strength gains and dynamic balance. Interdisciplinary work emerges as an important factor for this result to be effective.
Park et al., (2018)	Patients with post-prostatectomy urinary incontinence, totaling 59 participants.	Progressive resistance training focused on the pelvic floor muscles. It began 2 weeks after surgery and lasted 12 weeks. Hip extension, flexion, abduction and adduction exercises, performed quickly. Subdivided into two phases: **(1)** Kegel-based weight-bearing exercises (The protocol consisted of: 10 minutes of warm-up, 40	The severity of urinary incontinence was measured using a 1-hour pad test. The results are presented as means ± standard deviation. Statistically significant differences in preoperative parameters in the subgroups were analyzed using analysis of variance, chi-square, independent t-tests and paired t-tests. Predictors of continence status at 12 weeks were assessed using logistic regression analysis. The p-values	The protocol developed obtained important results, revealing that changes in the strength and endurance of the hip extensor muscles are directly correlated with continence. The study obtained a 58.5% continence rate in post-prostatectomy patients who performed the protocol over 12 weeks, as well as improved physical conditioning and general mental conditions. However, the authors did not report

		minutes of Kegel physical training and 10 minutes of cool-down, characterizing 1 session); **(2)** High-speed strength training with an elastic band. The sets consisted of 2 to 3, with 10 to 12 repetitions. In the initial weeks, the training was carried out using their own body weight; after 6 weeks, a green elastic band (very low tension) was added.	were bilateral, with $p < 0.05$ considered statistically significant. Statistical analysis was performed using SPSS® version 22.0 (IBM, Armonk, NY, USA).	the number of sessions held per week during this intervention period.

V. Discussion

Exercise Programs and Interventions

Authors such as Fernandes and Neto (2021), Nakamura et al. (2015) and Araujo et al. (2021) explored a variety of exercise programs, from strength training to more specific practices such as pelvic floor muscle training.

These studies highlight the effectiveness of different approaches, such as the use of dance, aerobic activities, and specific exercises for muscle strengthening, flexibility, coordination and balance.

The results range from improvements in functional capacity and physical fitness to a significant reduction in urinary incontinence.

Some authors have been concerned with identifying the risks that resistance training can cause in relation to the onset of urinary incontinence.

Pires et al. (2020), Araujo et al. (2021), Wikander et al. (2021) and (2022) identified that the practice of exercises with high intensity, high impact, exaggerated training volume, poor training technique and excessive pressure on the intra-abdominal region lead to early experimentation with possible dysfunction of the pelvic floor muscles.

Deadlift, free squat with load, front squat and sumo squat exercises performed according to the identified risks were found to be the main causes of urine leakage episodes during practice (Wikander et al. 2022).

In addition, Cross et al. (2023) systematized a resistance training protocol focusing on deadlifts and free squats, both at a low to moderate level, obtaining significant results in reducing fat mass and stress urinary incontinence. Complementing this, Araujo et al. (2021) points out that CrossFit practitioners, after drastically reducing the intensity of their daily workouts, training only with their own body weight, obtained a reduction in urine loss during exercise.

Cross et al. (2023) also pointed out that, after the maintenance period, they applied a load progression protocol and then a wave periodization on the training days each week, concluding that low and moderate resistance training does not aggravate SUI.

This data provides knowledge for prescribing specific protocols that are coherent with the patient's reality, since cases of urinary incontinence have multifactorial aspects and vary from person to person.

Cross et al. (2023), Bo et al. (2021), Park et al. (2018) and Virtuoso et al. (2016) point out that 12 weeks of intervention were sufficient to obtain significant results in reducing BMI, significant gains in strength, a reduction in urine leakage related to everyday situations, maintenance of continence, improved physical fitness and a reduction in urinary incontinence symptoms. Furthermore, Virtuoso, Menezes and Mazon (2019) add that after 4 weeks of intervention, it was possible to identify an early reduction in UI symptoms.

This increase in strength in the first few weeks is due to greater recruitment of muscle fibers, resulting in neuromuscular adaptation, reflected in a reduction in UI symptoms and in the levels of maximum voluntary contractions of the pelvic floor muscles.

Training sessions for middle-aged and elderly people ranged from 2 to 3 times a week (Bo et al. 2021) (Fitz et al. 2020) (Virtuoso et al. 2019) (Lin Lyu et al. 2021). Only one study obtained data in which participants exercised more than 5 times a week, and the predominant audience was adult women practicing CrossFit (Araujo et al. 2021).

These findings highlight the difference in the level of physical fitness and that, as age advances, this fitness decreases considerably, as does flexibility, balance and strength. It is therefore important to have a good knowledge of the variables in order to manipulate training protocols.

These studies have shown promising results when it comes to prescribing exercises for patients with urinary incontinence, revealing that the levels of intensity and volume of training vary according to age and level of incontinence.

Some studies followed guidelines, protocols and guidance from organizations such as the Consensus on Exercise Reporting Template (CERT), the American College of Sports Medicine (ACSM), the Powerlifting course or were based on other studies with the same theme (Cross et al. 2023; Virtuoso et al. 2016; Fitz et al. 2019).

Program Evaluation

Authors such as Cross et al. (2023), Wikander et al. (2022) and Virtuoso; Menezes and Mazon (2019) examined programs that combined resistance training with specific exercises for the pelvic floor muscles, observing improvements in muscle strength and a reduction in urinary incontinence.

Lin Lyu et al. (2021), Fitz et al. (2020), Virtuoso; Menezes and Mazon (2019) point out that patients who knew how to contract the pelvic floor muscles and the transverse abdominal muscles had superior results compared to those who were not fully aware.

This data underscores the importance of a high level of awareness of one's own body by highlighting the superiority of those who were fully aware of performing specific muscle contractions.

Body awareness is not only intertwined with achieving superiority in resistance training protocols, but also encompasses aspects related to mental well-being, gaining balance, increasing functional capacities, improving motor coordination and preventing injuries.

Lin Lyu et al. (2021) investigated the responses of cocontraction exercises for the transverse abdominal muscles and the pelvic floor muscles. The results indicated that there was a higher cure rate compared to the group that only performed pelvic floor exercises.

Park and colleagues (2018) identified that the levels of resistance and strength gain of the hip extensors are directly correlated with continence.

These authors obtained significantly interesting results by presenting new ways of systematizing future interventions. However, the literature still lacks this type of study and there is a gap to be explored.

Authors such as Bo et al. (2021) and Pires et al. (2020) observed that traditional weight training accompanied by a professional had a higher adherence rate compared to other training protocols.

Other studies, such as those by Pires et al. (2020), Fitz et al. (2020), Virtuoso; Menezes and Mazon (2019) and Virtuoso et al. (2016), have highlighted the importance of professional supervision when implementing these programs, demonstrating superior results when compared to exercises performed at home.

These findings make supervision an empowering mechanism for achieving early results, as well as acting as a motivational stimulus, advocating continuity and progress in treatment.

Specific Populations

Some studies, such as Pires et al. (2020) and Park et al. (2018), focused on specific populations, such as athletes and post-prostatectomy patients, respectively. This highlights the need to adapt exercise programs to the individual needs of the participants.

Lin Lyu et al. (2021), Nakamura et al. (2015) and Virtuoso et al. (2016) focused on middle-aged women with stress urinary incontinence, demonstrating the effectiveness of specific programs for this condition and that resistance training appears to be a mechanism for maintaining continence.

Wikander et al. (2022) analyzed the data obtained from female weightlifting athletes, finding the possible risk factors for the onset of urinary incontinence in this audience. This finding reveals specific exercises, intensity and volume that should be avoided when prescribing for a more beginner and intermediate audience.

Fitz et al. (2019), Virtuoso, Menezes and Mazon (2019) covered their interventions in elderly women with stress urinary incontinence, demonstrating that pelvic floor muscle training and the awareness phase are a mechanism capable of enhancing the treatment of incontinence.

The authors Araujo et al. (2021), Fernandes and Neto (2021) and Pires et al. (2020) focused on investigating an age group of younger women who had a higher level of adherence to traditional bodybuilding practices, gymnastics classes and CrossFit exercises respectively.

Evaluation instruments

Several studies have used different assessment tools such as questionnaires, physical fitness tests and interviews to measure the effectiveness of exercise programs.

The use of tools such as the Incontinence Severity Index (ISI), the King's Health Questionnaire (KHQ) and the International Consultation on Incontinence Questionnaire (ICIQ) allowed for a comprehensive assessment of the results.

The sociodemographic data made it possible to identify variables such as age, body mass index, birth history, obstetric data, triggers for UI, surgery or type of pathology, as well as anthropometric characteristics.

Some studies collected data through virtual platforms, social networks and e-mail. Targeting platforms were used because the aim and focus was to reach the desired audience for inclusion in the studies.

To quantify the amount of urine lost, the authors used methods recommended by the International Continence Society (ICS) such as pad testing, which consists of using a pad pre- and post-test. Approaches such as interviews with questions about the amount of pads used daily and the frequency of UI episodes were used.

Most of the studies included a physiotherapy professional whose role was to assess the functional capacities of the pelvic floor, using methods such as pelvic floor dynamometry and the modified Oxford scale, as well as supervising the training protocols for the pelvic floor muscles through follow-up.

Weight training professionals were responsible for systematizing resistance training protocols, using tools such as elastic bands, dumbbells and weight machines. A variety of intervention methods were also covered, consisting of personalized training accompanied by a personal trainer, supervision for home training, Body Pump protocols, gymnastics classes and Cross Fit.

To analyze the validity of the data, statistical analysis and the homogeneity of the variables, the Shapiro-Wilk method, IBM SPSS software and the M box test were used, respectively, in addition to other specific methods and tests.

VI. Conclusion

In general, the studies showed positive results regarding the effectiveness of exercise programs in improving health and reducing urinary incontinence. The implications of these results underline the importance of physical activity and specific training in promoting women's health and quality of life.

By comparing and contrasting different studies, it is possible to gain a broader understanding of effective approaches to the treatment and prevention of urinary incontinence, as well as identifying gaps in research that can guide future investigations.

It is essential that protocols take into account the biological individuality of each individual, especially clinical cases. In short, urinary incontinence has multifactorial aspects, such as parity, surgical procedures, sedentary lifestyle, obesity and others.

The Physical Education professional is fundamental in drawing up resistance training protocols, with specific approaches and individualized characteristics. The ability to identify possible causes of urine loss during training sessions is a crucial skill for gym instructors and personal trainers.

The protocols should be adapted to the patient, taking into account the identification of triggers, risk factors, anthropometric data, age and possible pelvic floor dysfunction due to parity or surgery.

There is a need for more interventions and studies to address the impact of resistance exercises on urinary incontinence, present new protocols and make new comparisons, so that an effective and systematized approach can be developed.

In conclusion, the impact that resistance exercises can have, whether positive or negative, depends on the strategic capacity of each professional involved in developing the protocol. Success is only possible when knowledge becomes an ally, consciously emerging as a fundamental force that will guarantee adherence to the exercise protocol. Furthermore, in addition to significant improvements, exercise in general should be practiced daily, as it is the best remedy for preventing diseases and muscle dysfunctions.

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