Systematic review and meta-analysis of traditional exercise therapy to improve lumbar disc herniation

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Abstract: **Objective** Evidence-based medicine method was used to evaluate the effect of Chinese traditional exercise therapy for lumbar disc herniation. **Methods** Randomized controlled trial (RCT) of Tai Chi, YijinJing, Wuqinxi and Baduanjin for the treatment of lumbar disc herniation was retrieved from CNKI, VIP, SinoMed and Wanfang databases. Two researchers independently screened, extracted and cross-checked the literature according to the inclusion criteria and exclusion criteria, and evaluated the quality of the literature using the Cochrane System Evaluation Manual. Meta-analysis was performed with stata16 software. **Results** A total of 12 studies with 995 cases were used. Meta-analysis results showed that : Visual analogue scale (VAS) [MD=-0.75, 95% CI (-1.09, -0.41), P<0.01], Japanese Orthopaedic Association (JOA) lumbar spine score [MD=3.99, 95% CI (3.77, 5.21), P<0.01], Oswestry disability index (ODI) [MD=-4.74, 95%CI (-6.52, -2.95), P < 0.01].**Conclusion** Traditional exercise therapy such as Tai Chi can reduce the pain of lumbar disc herniation and improve lumbar function. However, the quality of the included literature is low and the evidence of curative effect is limited. Therefore, larger samples, multi-centers and high-quality randomized controlled trials are needed to support this.

1. Introduction

Lumbar disc herniation (Lumbar disc herniation, LDH) is one of the most common diseases in orthopedics, it is due to the degeneration of the lumbar intervertebral disc, the fibrous annulus is ruptured due to external forces, and the nucleus pulposus is protruding, compressing the sinus vertebral nerve and nerve root The main symptoms of lesions that cause low back and leg pain are treated with non-steroidal anti-inflammatory drugs, traction, physical therapy, surgery, and exercise therapy [1]. Exercise therapy refers to the use of equipment, bare hands or the patient's own strength, exercise therapy through certain exercise methods (active or passive exercise, etc.), so that the patient can obtain the training method of body or local motor function, sensory function recovery.Traditional Chinese exercise therapy is an important part of exercise therapy. It is based on the basic theories of

traditional Chinese medicine and the theory of health and rehabilitation, combined with exercise training, and is a non-drug characteristic therapy for the purpose of strengthening physical fitness and regulating health [2]. It has the ability to dredge the channels and collaterals. It has the effects of blood, dissolving adhesions, smoothing joints, promoting blood circulation and removing blood stasis, strengthening muscles and bones.Relevant studies have shown that traditional exercise therapy (including Tai Chi, Yi Jin Jing, Wu Qin Xi, and Baduan Jin) can alleviate the pain and dysfunction caused by lumbar disc herniation. It can also enhance the efficacy as an adjuvant therapy. In order to seek further evidence support, Evidence-based medicine methods are used to evaluate the improvement of pain and functional limitation in patients with lumbar disc herniation in traditional exercise therapy, and provide a reference for future high-quality research.

2. Materials and methods

2.1 Meet the standard

(1) RCT documents that have been published publicly, regardless of whether they are blindly used or not. (2) Patients who have been diagnosed with lumbar disc herniation according to international or Chinese medical diagnostic standards and clinically. (3) Intervention measures: The treatment group adopts traditional exercise therapy or traditional exercise therapy combined with other therapies, and the control group adopts non-traditional exercise therapy. (4) Outcome indicators: VAS visual analogue score, JOA lumbar spine score, ODI score.

2.2 Exclusion criteria

(1) Non-RCT literature; (2) Literature design is not rigorous (diagnosis, curative effect judgment standards are not standardized, sample data is not complete); (3) Literature with incomplete outcome indicators and data that cannot be combined.

2.3 Search strategy

Randomized Controlled Trials (RCT) of Tai Chi, Yijinjing, Wuqinxi, and Baduanjin in the treatment of knee osteoarthritis were retrieved from PubMed, CNKI, VIP, SinoMed, wangfang and other literature databases. The retrieval time is from the establishment of the database to 2020. The search adopts a combination of subject search and free search. Chinese search terms include: "Tai Chi", "Yijin Jing", "Wu Qin Xi", "Ba Duan Jin", "Traditional Exercise Therapy", "Lumbar Intervertebral Disc Herniation"; English search terms include: "Tai Chi", "Yijin" Jing", "Wuqinxi", "Baduanjin","Chinese traditional exercise therapy","Lumbar Disc herniation". In order to prevent omissions, an expanded search of the references of the included literature was carried out.

2.4 Document selection and data extraction

Two researchers independently browsed the title of the literature, the abstract and the full text, and decided whether to include it according to the exclusion criteria. The extracted information includes the author's name, publication year, research design, intervention measures, intervention time, outcome indicators, quality methodological content, etc., and cross-checking is performed after each is completed independently. If the opinions are not uniform, they can be discussed or handed over to the third researcher.

2.5 Bias risk and literature quality evaluation

According to version 5.1.0 of the Cochrane Systematic Review Manual, two researchers will independently evaluate each of the following items in the included literature: "high risk of bias", "low risk of bias", and "unclear": random sequence Generation, distribution, concealment, blinding of research subjects and interveners, blinding of outcome measurers, completeness of outcome index data, possibility of selective reporting of research results, and other sources of bias. The quality evaluation adopts a points system. For each of the above six bias indicators, 1 point is given for low risk, and no point for high risk and unclear. The total score is 6 points. 1 to 3 are classified as low quality, 4 to 5 are classified as medium quality, and 6 is classified as high quality.

2.6 Statistical analysis

Meta-analysis was performed on the extracted data using stata16 software. Combined effect size: The outcome indicators in this article are all measurement data, using mean difference (MD), and each effect size and its 95% confidence interval (CI) are used to express the results. Perform a heterogeneity test for each study. When I2<40%, it shows good homogeneity, then the fixed-effects model is used for Meta analysis; when I2 ≥ 40%, the random-effects model is used, and subgroup analysis or Sensitivity analysis identifies the source of heterogeneity. Bias risk assessment: When there are ≥7 research articles, use funnel chart to analyze potential publication bias.

3. Results

3.1 Literature search results and flowchart

A total of 471 related studies were retrieved, and a total of 12 studies were included according to the inclusion and exclusion criteria of the articles [3-14]. The specific screening process is shown in Figure 1.
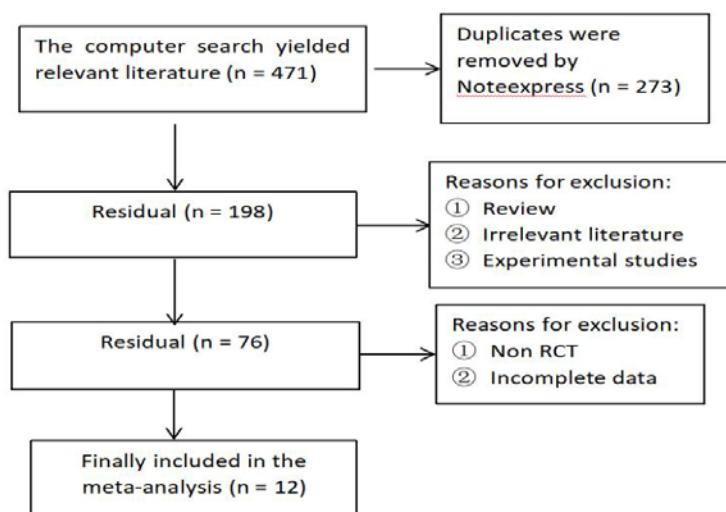

Figure 1: Flow chart of literature screening

3.2 The basic characteristics of the included research literature

A total of 12 articles were included in this study, with a total of 995 subjects, of which 497 were the observation group, 498 were the control group, 99 were the largest sample size, and 20 were the

smallest sample size. Seen in Table 1 for specific information and inclusion indicators.

Table 1: Basic information included in the study

Include literature	Sample size		Average patient age/ year		Average course of disease/ month		Intervention		Intervene time	Outcome indicators
	T	C	T	C	T	C	T	C		
Bai Bai[3] 2013	32	32	40.03	38.34	0.5		Yi Jin Jing+acupuncture	acupuncture	4 weeks	VAS, ODI
Zhang Qi[4] 2018	99	99	40.32 ±3.98	44.60 ±3.76	3.60 ±3.44	3.50 ±3.76	Yi Jin Jing+Tuina	Tuina	6 months	JOA
Li Fei[5] 2017	30	30	42.65 ±6.54	44.13 ±5.13	14.88 ±1.2	16.56 ±6.24	Wuqinxi+Tuina	Tuina	5 months	VAS, ODI
Lin Zhihui[6] 2014	25	25	40.12 ±11.51	41.31 ±9.73	>6		Wuqinxi+surgery	Conventional forging Refining+surgery	6 months	JOA
Wei Fangxin[7] 2015	65	65	37.9 ±7.5	38.4 ±8.2	3.9 ±0.6	4.1 ±0.8	Tai Chi+Chinese medicine fumigation	Conventional Physical therapy	3 months	VAS
Liu Shuli[8] 2018	30	30	/	/	/	/	Tai Chi+acupuncture	acupuncture	6 months	JOA
Cai Xiangbi[9] 2009	27	29	54.53 ±11.25	52.46 ±9.87	11.56 ±33.87	13.89 ±26.65	Yi Jin Jing	Pelvic traction	4 weeks	VAS
Han Baoliang[10] 2012	20	20	50.11 ±2.15	51.82 ±1.86	3.35 ±1.15	3.32 ±1.46	Baduanjin±Interference electricity	Interference electricity	4 weeks	VAS, ODI
Xv Xingxing[11] 2018	45	45	45.27 ±4.24	44.71 ±4.42	24.33 ±10.84	23.91 ±10.16	Baduanjin	Tuina	3 months	VAS
Jiang Hui[12] 2013	32	32	46.33 ±9.46	47.25 ±8.43	5.59 ±3.29	6.02 ±2.78	Baduanjin	Conventional forging Refining	8 weeks	VAS, JOA
Wang Zhenguo[13] 2016	32	31	42.04 ±6.06	41.57 ±7.23	30.6 ±6.6	31.0 ±7.8	Baduanjin+Needle knife	Conventional forging Refining+Needle knife	20 days	VAS, JOA
Yin Yihong[14] 2017	60	60	28 ±15.6	29 ±13.8	42 ±33.6	39.6 ±36	Yi Jin Jing	Conventional forging Refining+acupuncture	4 weeks	VAS, JOA, ODI

3.3 The literature bias risk and quality evaluation of the included studies

① Generation of random sequence: 12 documents all use random number table to generate random sequence. ② Allocation concealment: none of the included literature mentions the allocation concealment scheme explicitly. ③ Blind method: None of the included studies mentions the blind method to the investigators, subjects and outcome indicator evaluators. ④ Data integrity: 3 papers [4,9,13] recorded loss to follow-up and drop-out, of which 2 papers [9,13] have detailed explanations, 1 paper [4] did not explain, and the rest of the literature did not appear. ⑤ Selective report: There is no selective report in the 12 articles. ⑥ Other biases: 1 article [8] did not report the basic condition of the patient. The methodological quality of the included 19 studies is shown in Table 2.

Table 2: Methodological quality evaluation of included in the study

Include literature	Random sequence	whether Blinding	distribution hide	Result data integrity	Selective report	Other biases	quality Evaluation
Bai Bai[3] 2013	Random number table	Not mentioned	Not mentioned	Low risk of bias	Low risk of bias	Low risk of bias	4
Zhang Qi[4] 2018	Random number table	Not mentioned	Not mentioned	3 cases of shedding (not specified)	Low risk of bias	Not sure	2
Li Fei[5] 2017	Random number table	Not mentioned	Not mentioned	Low risk of bias	Low risk of bias	Low risk of bias	4
Lin Zhihui[6] 2014	Random number table	Not mentioned	Not mentioned	Low risk of bias	Low risk of bias	Not sure	3
Wei Fangxin[7] 2015	Random number table	Not mentioned	Not mentioned	Low risk of bias	Low risk of bias	Not sure	3
Liu Shuli[8] 2018	Random number table	Not mentioned	Not mentioned	Low risk of bias	Low risk of bias	High risk of bias	3
Cai Xiangbi[9]	Random number table	Not mentioned	Not mentioned	5 cases of shedding (with instructions)	Low risk of bias	Low risk of bias	4
Han Baoliang[10] 2012	Random number table	Not mentioned	Not mentioned	Low risk of bias	Low risk of bias	Not sure	3
Xv Xingxing[11] 2018	Random number table	Not mentioned	Not mentioned	Low risk of bias	Low risk of bias	Low risk of bias	4
Jiang Hui[12] 2013	Random number table	Not mentioned	Not mentioned	Low risk of bias	Low risk of bias	Low risk of bias	4
Wang Zhenguo[13] 2016	Random number table	Not mentioned	Not mentioned	3 cases of shedding (with instructions)	Low risk of bias	Low risk of bias	4
Yin Yihong[14] 2017	Random number table	Not mentioned	Not mentioned	Low risk of bias	Low risk of bias	Not sure	3

3.4 META analysis results

3.4.1 VAS score

In the included literature, 9 studies compared the VAS pain scores at the end of the intervention of traditional exercise therapy for lumbar disc herniation. The analysis showed that the studies have high heterogeneity (I2 = 81.73%), and the random effects model is adopted. Meta analysis showed that the difference was statistically significant [MD = -0.75, 95% CI (-1.09, -0.41), P<0.01], seen in Figure 2.Sensitivity analysis of the included literature found no obvious source of heterogeneity. Subgroup analysis was performed according to the literature quality score: 6 of the studies were of medium quality, and the heterogeneity test showed: I2 = 35.47%, the difference within the group was statistically significant [MD = -0.51, 95% CI (-0.74, -0.28), P＜0.00001].The 3 studies were of low quality, and the heterogeneity test showed: (I2 = 38.26%), the difference within the group was statistically significant [MD =-1.30, 95% CI (-1.62, -0.97), P＜0.00001], details Seen in Figure 3.This subgroup analysis significantly reduces the heterogeneity between the studies within the group, there are differences between the groups, and the subgroup analysis is meaningful.
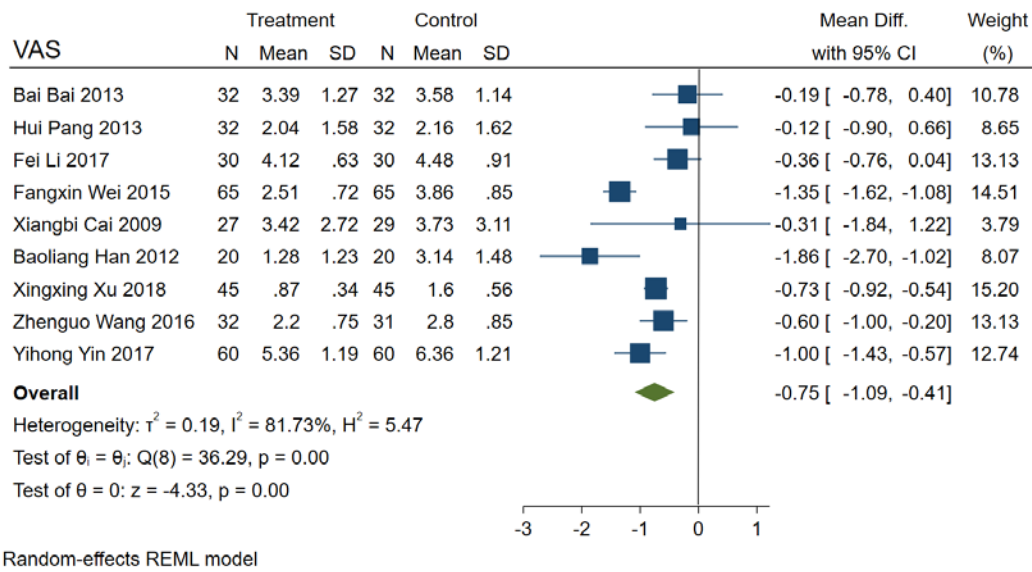
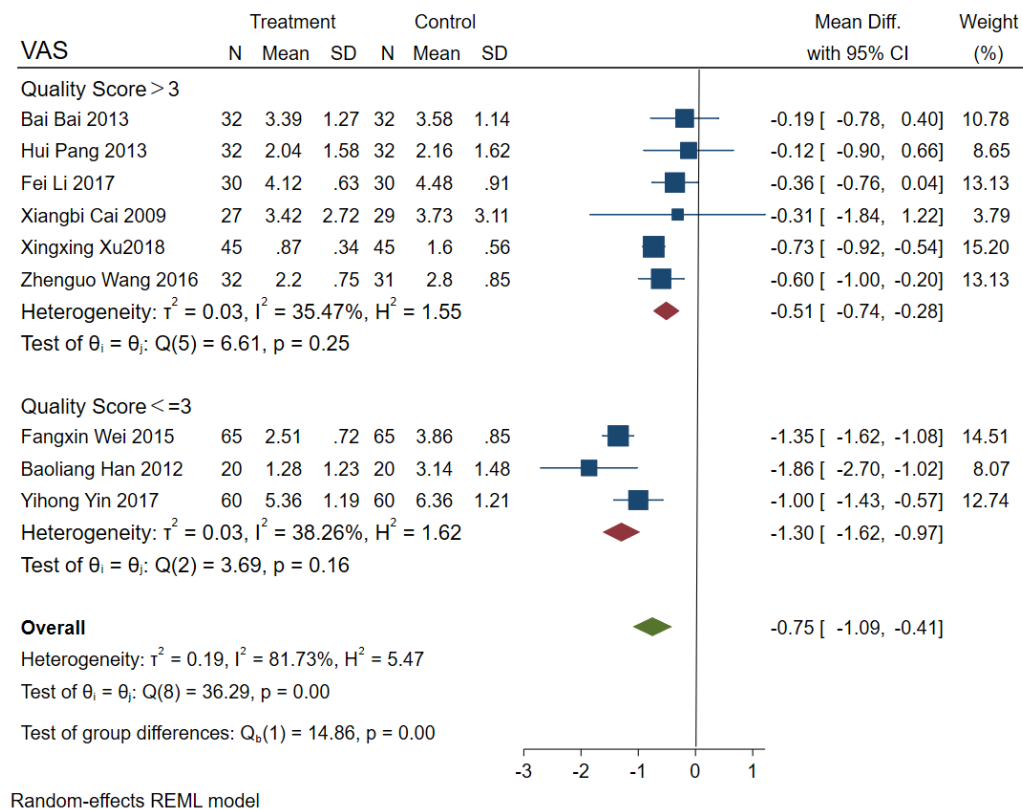*Figure 2: Forest plot for Meta-analysis of the VAS*

Figure 3: Subgroup analysis of the VAS

3.4.2 JOA score

In the included literature, 6 studies compared the JOA scores at the end of the intervention of traditional exercise therapy for lumbar disc herniation. The analysis showed that the studies have high heterogeneity ($I2 = 73.24\%$), and the random effects model was adopted for Meta Analysis showed

that the difference was statistically significant [MD = 3.99, 95% CI (3.77, 5.21), P <0.01], seen in Figure 4. Sensitivity analysis of the included literature found no obvious source of heterogeneity. According to the intervention time, the subgroup analysis was performed: the intervention time of 3 studies was less than 3 months, the heterogeneity test showed: (I2 = 0%), the difference within the group was statistically significant [MD = 3.00, 95% CI (1.83, 4.17), P＜0.01].The intervention time of 3 studies> 3 months, heterogeneity test showed: (I2 = 85.76%), the difference within the group was statistically significant [MD = 4.73, 95% CI (2.84, 6.62), P <0.01], Seen in Figure 5 for details.This subgroup analysis significantly reduced the intragroup heterogeneity of the study with an intervention time of less than 3 months. Differences between the groups exist, and the subgroup analysis is meaningful.
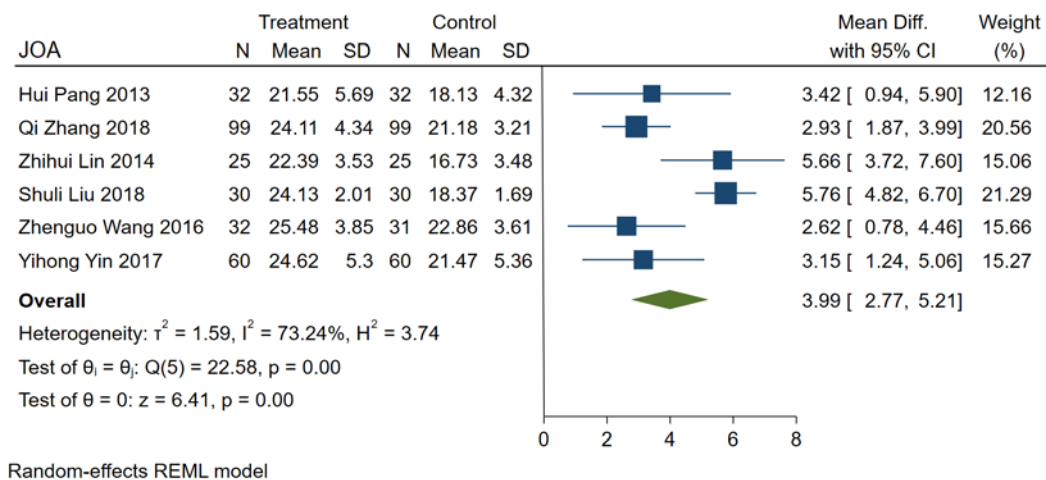

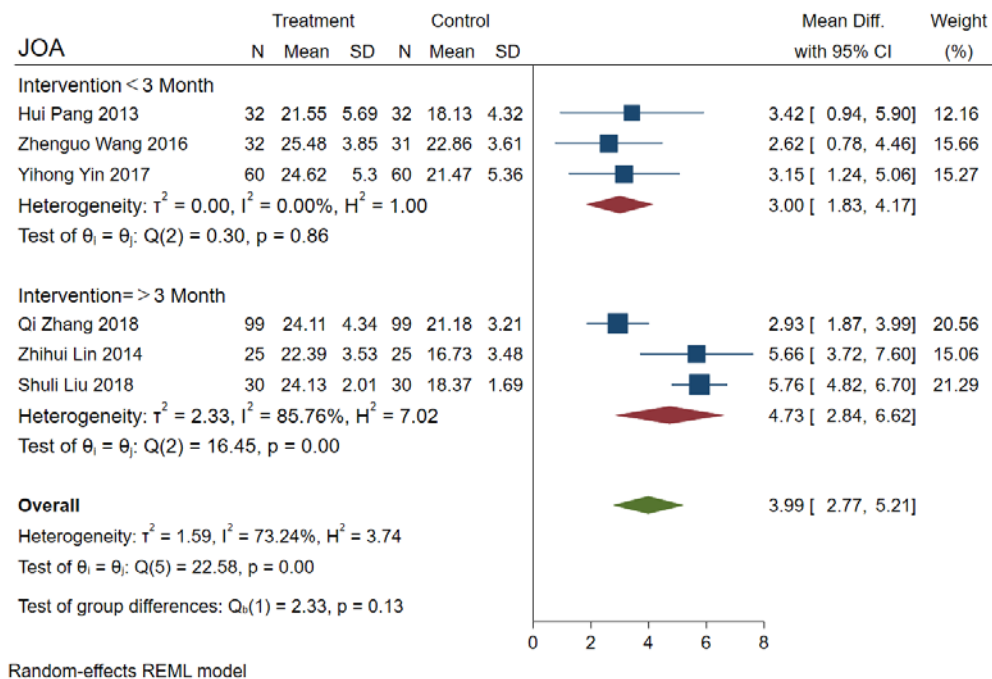*Figure 4: Forest plot for Meta-analysis of the JOA*

Figure 5: Subgroup analysis of the JOA

3.4.3 ODI score

In the included literature, 4 studies compared the ODI scores at the end of the intervention of traditional exercise therapy for lumbar disc herniation. The analysis showed that the studies had moderate heterogeneity (I2 = 44.13%), and the random effects model was adopted for Meta Analysis showed that the difference was statistically significant [MD = -4.74, 95% CI (-6.52, -2.95), P<0.01], seen in Figure 6.Sensitivity analysis of the included literature shows that the heterogeneity comes from the research in vain. After elimination, the heterogeneity among the studies is significantly reduced (I2 =0%). The fixed effects model is used for Meta analysis, and the difference is statistically significant [MD = -5.35, 95% CI (-6.54, -4.16), P<0.01].
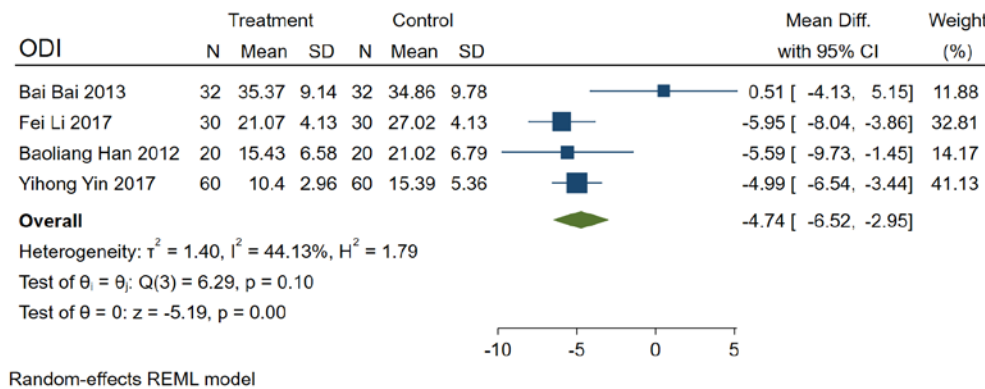

Figure 6: Forest plot for Meta-analysis of the ODI

3.4.4 Publication bias

The funnel chart of the clinical total effective rate is not completely symmetrical. The reason may be that the overall quality of the included literature in this study is not high, the control methods used among the studies are not completely consistent, and the length of intervention of the included studies is inconsistent. Seen in Figure 7.
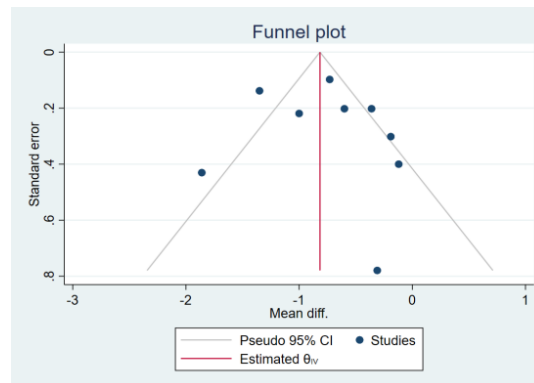

Figure 7: Funnel plot for the VAS

4. Discussion

4.1 Result analysis

A total of 12 RCT literatures on traditional exercise therapy for lumbar disc herniation were included in this study. The test group is better than the control group in terms of VAS score, lumbar JOA score, ODI score, etc., but there is a large heterogeneity between the studies, reducing the

credibility of the combined analysis, in order to find the source of heterogeneity, sensitivity analysis and subgroup analysis were carried out on the included studies. Through subgroup analysis of multiple factors that may affect the VAS score, it is finally found that the heterogeneity comes from the quality of the literature. The heterogeneity between the medium-quality literature and the low-quality literature group is low, and the heterogeneity between the groups is high, indicating that the group The internal combination is credible, and the conclusions of the two subgroups are unified, indicating that traditional exercise therapy alone or in combination with other therapies can definitely reduce the pain symptoms of lumbar disc herniation. A subgroup analysis of multiple factors that affect lumbar JOA scores found that the heterogeneity comes from the intervention time. The heterogeneity is low within 3 months of the intervention time, and the heterogeneity is high within the intervention time of more than 3 months, indicating that it is used alone. The short-term effect of traditional exercise therapy or combined with other therapies on lumbar disc herniation is definite, and the long-term effect needs further study. However, the heterogeneity between studies with ODI scores is between high and low. Sensitivity analysis found that after excluding studies that were in vain [3], the heterogeneity was significantly reduced, and the combined results were credible. Traditional exercise therapy alone or combined with other therapies was used. It can definitely improve the patient's limited lumbar spine function.

4.2 Limitations and Enlightenment

Limitations of this study: The combined indicators are subjective evaluations, and there is a certain measurement bias; the exercise prescriptions and movement combinations involved in traditional exercise therapy in the included study are not standardized; the included literature is all Chinese literature, and the quality of the literature is low, so it is included There are deficiencies in the methodology of the research of, and all the documents have not realized blinding, and have not carried out allocation concealment. Implications for follow-up research: adopt more objective measurement methods for the evaluation indicators involved in the research; use more standardized exercise prescriptions and combined actions during research; rigorous methodological design should be carried out before the research, and clinical measures should be adopted. The research method of the center and large sample size strictly implements the corresponding standards and standardizes the data statistics to ensure the quality of the research.

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