The effect of using back support (orthosis) on non-spesific back pain in adults: A meta-analysis

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Abstract---Back pain has become a common health problem experienced in various countries, not only developing countries but also in developed countries. The purpose of this research conducted a meta-analysis to estimate the strength of the influence of using back support (orthosis) on reducing the degree of non-specific back pain in adulthood which can be caused by various risk factors. This study uses a meta-analysis design and a systematic study by taking adults according to inclusion and exclusion criteria. This study covers several databases including Google Scholar, Pubmed and Springer Link. By using the keywords "lumbar support", "spinal orthosis", "Low back pain", "RCT (Randomized Controlled Trial) ". The results of using back support (orthosis) -1.62 were better in reducing pain in non-specific back pain patients compared to those without back support orthosis, but statistically not significant (ES= -1.62; 95% CI -5.02 to 1.78; p= 0.35).

Keywords---back support (orthosis), non-spesific back pain, adults.

Introduction

Back pain is very susceptible to occur due to several factors and risks such as age, gender, certain pathologies or even habits that occur in daily life which can later affect a person's activities. Many understandings from experts who define lower back pain, it can be concluded that low back pain is a clinical symptom that has become a common problem experienced by a person accompanied by pain between the last ribs with folds in the gluteal which can result from multifactor including individual character, working conditions and psychological factors(Chou et al. 2017; Li et al. 2012). Pain that is felt in the lower back can radiate to other areas or vice versa (Referred pain), lower back pain is associated with an increasing population in old age which is the main cause worldwide. Low back pain can cause discomfort and disability of unknown degree(Buchbinder et al. 2018; Ogendi 2019).

The International Association for the Study of Pain (IASP) defines pain as an unpleasant sensory and emotional experience that is primarily associated with tissue damage or describes the damage or both. The experience of pain is different from the experience of paradigmatic perception; pain is usually caused when nociceptors are activated. Nociceptors themselves are defined as sensory receptors that respond to stimuli(Gray 2019). In developing countries such as Indonesia, the prevalence of low back pain increased by 18% in 2018 in line with Indonesia's increasing age (director general of health care). In addition, in the Middle East region, the State of Iran reported that low back pain had a prevalence of 51.7% due to the posture of carpet weavers.(Chaman et al. 2015).

There are several treatments that can be done when low back pain occurs which is expected to reduce pain and discomfort, such as using a spinal orthosis, back therapy, or by doing the right exercise. Such as research conducted in Indonesia that there is an effect of using a lumbar corset (orthosis) on reducing low back pain in patients with low back pain.(Ningsih and Setyawan 2016; Rachmat 2020 nd; Usman 2021).

Method

This study uses a systematic review and meta-analysis. In conducting article selection, this research includes several databases including Google Scholar, Pubmed and Springer Link. By using the keywords "lumbar support", "spinal orthosis", "Low back pain", "RCT". The PICO in this study includes P (Population) = non-specific back pain, I (Intervention) = Back support, C (Comparison) = other treatments, O (Outcomes) = Pain reduction. In this study, inclusion and exclusion criteria were used to specify the articles to be selected. The inclusion criteria are 1) full text articles with RCT design, 2) articles according to the topic, namely back pain, 3) Have bivariate research data. 4) published from 2018-2022. While the exclusion criteria are 1) research with observational study. 2) publication of articles other than English. Data processing using a review manager (RevMan 5.4) was measured by effect size and heterogeneity to determine the combined research model and form the final results of the meta-analysis on the forest plot and funnel plot. The article search flow follows the PRISMA flow diagram.

Results

The selection of articles in this study was carried out in 3 databases, with a total of 594 initial articles spread across the three databases, which were then filtered according to the inclusion and exclusion criteria that had been set. The results of the article selection can be seen in the PRISMA flow diagram in image 1. The articles that have been selected to be included in the meta-analysis are spread over 3 different continents, namely 3 articles on the European continent, 2 articles on the Asian continent, and 1 article on the Americas, can be seen in image 2.
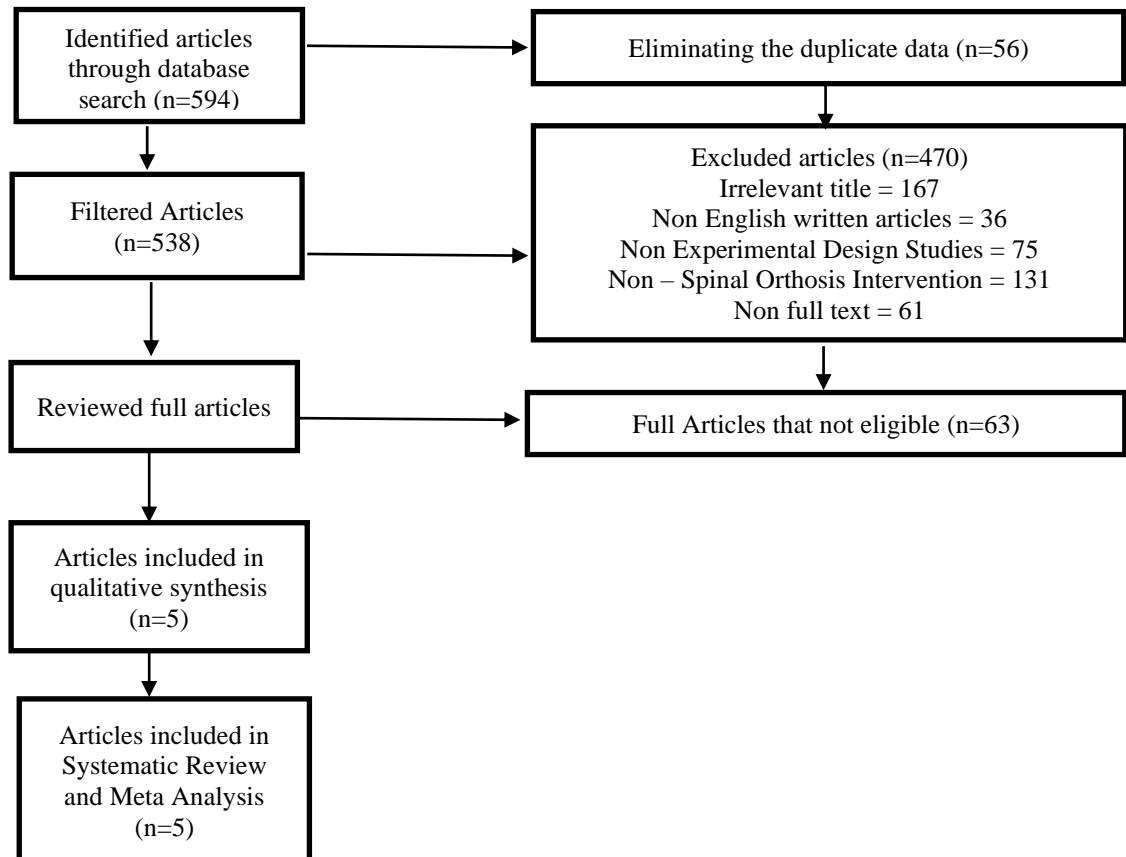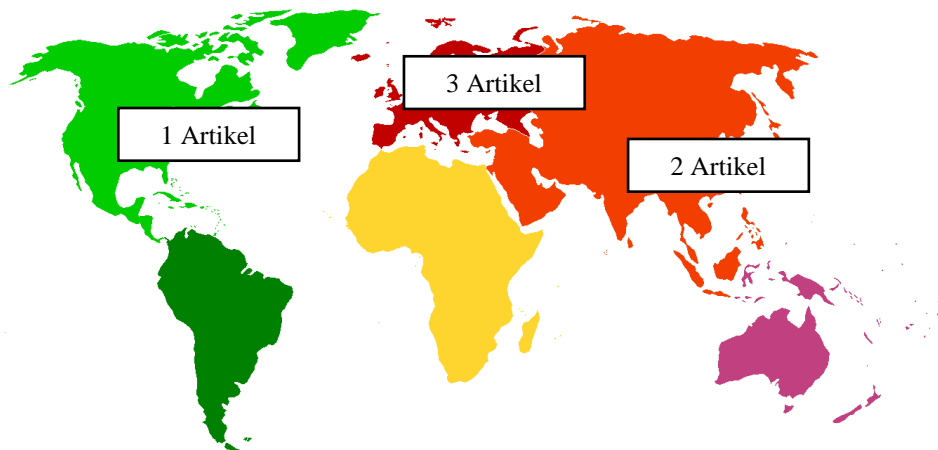
Image 1. PRISMA flow diagram

Image 2. Overview of the research area (Gifex, 2009)

There are 5 study articles from 4 different countries, namely Iran, Spain, Sweden, and Texas using a randomized controlled trial for meta-analysis. It can be seen in table 1.

Tabel 1
Description of the primary studies included in the meta-analysis

Writer (Year)	Country	Study Design	Sample	P	I	C	O
(Samani et al, 2019)	Iran	*Randomized Controlled Trial*	42 Participants with chronic nonspecific Low Back Pain, have Inclusion and exclusion criteria	Patients were diagnosed with chronic nonspecific Low Back Pain, the mean age in the normal pressure group was 35.85 years and in the control group was 34.46 years.	Seeing the effect of using lumbarosacral orthosies for 4 weeks	Did not see the effect of using Spinal orthosis on pain, but with other therapies, namely all groups were given non-steroidal anti-inflammatory drugs (NSAIDs).	Decrease the degree of pain
(Vanessa Cervero et al, 2019)	Spain	*Randomized Controlled Trial*	28 assembly-line workers with lumbar pain, have inclusion and exclusion criteria	Assembly line workers manufacturing company in spain with lumbar pain, mean age of intervention (lumbar support) 43 years and control group 41 years	Seeing the effect of using lumbar support for 2 months	Did not see the effect of using Spinal orthosis on pain, but with other therapies (using kinesiotape)	Decrease the degree of pain

(Annaswamy et al, 2021)	Texas	*Randomized Controlled Trial*	59 participants were randomized (34 controls and 25 interventions), have inclusion and exclusion criteria	Patients with uncomplicated chronic low back pain. The average age in this study is 48.9 years	Seeing the effect of using back brace support for 6 weeks	Did not see the effect of using Spinal orthosis on pain, but with other therapies (Exercise)	Decrease the degree of pain
(Azadinia et al, 2019)	Iran	*Randomized Controlled Trial*	44 sample participants (n= 22 per group)	Patients with low back pain. The average age of the intervention group was 27.45 years and the control group was 27.31 years	Seeing the effect of using lumbar sacral orthosis (LSO) for 4 weeks	Did not see the effect of using Spinal orthosis on pain, but with other therapies (Exercise)	Measuring the degree of pain
(Kaijser Alin et al. 2019)	Sweden	*Randomized Controlled Trial*	38 participants in the spinal orthosis intervention group and 38 participants in the training group	Patients with complaints of back pain due to osteoporosis. The mean age was 77.9 years in the spinal orthosis	Seeing the effect of using a spinal orthosis for 6 months.	Did not see the effect of using Spinal orthosis on pain, but with other therapies (Training)	Measuring the degree of pain
				group and 77.6 years in the training group			

Study or Subgroup	spinal orthosis			other treatment			Weight	Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total		
Alin CK 2019	29.95	3.93	38	21.55	3.96	38	20.4%	8.40 [6.63, 10.17]
Annaswamy TM 2021	5	1.78	25	6.71	1.56	34	21.3%	-1.71 [-2.58, -0.84]
Azadinia F 2019	5.14	1.66	22	4.84	1.46	22	21.2%	0.30 [-0.62, 1.22]
Cervero 2019	3.6	0.8	28	2.7	1.7	28	21.4%	0.90 [0.20, 1.60]
Samani M 2019	38.85	8.77	42	59.4	11.98	42	15.7%	-20.55 [-25.04, -16.06]
Total (95% CI)			155			164	100.0%	-1.62 [-5.02, 1.78]

Heterogeneity: Tau^2 = 13.95; Chi^2 = 186.14, df = 4 (P < 0.00001); I^2 = 98%
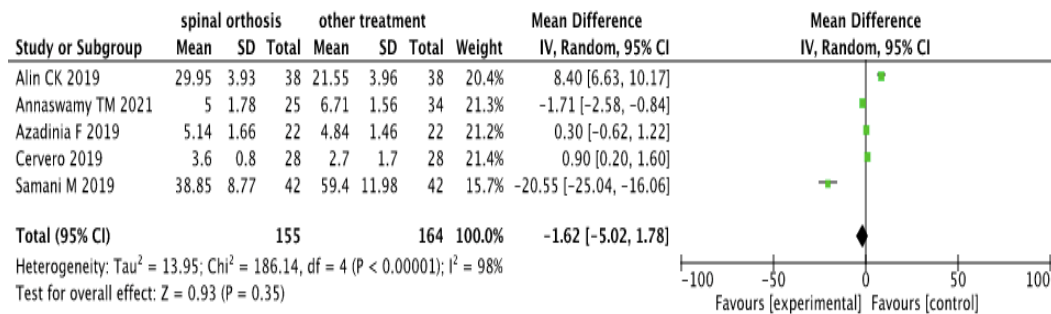Test for overall effect: Z = 0.93 (P = 0.35)

Image 3. Forest plot

The result interpretation of the meta-analysis process can be seen from the results of the forest plot which have been analyzed through the Revman 5.4 application. The forest plot shows that non-specific back support (orthosis) -1.62 is better in reducing the degree of pain in someone experiencing non-specific back pain when compared to no orthosis but with other treatments, non-back pain orthosis, (p= 0.35). In the picture above, it can also be seen that the heterogeneity of the research data shows I2 = 82% so that the distribution of the data is said to be very heterogeneous (random effect model).
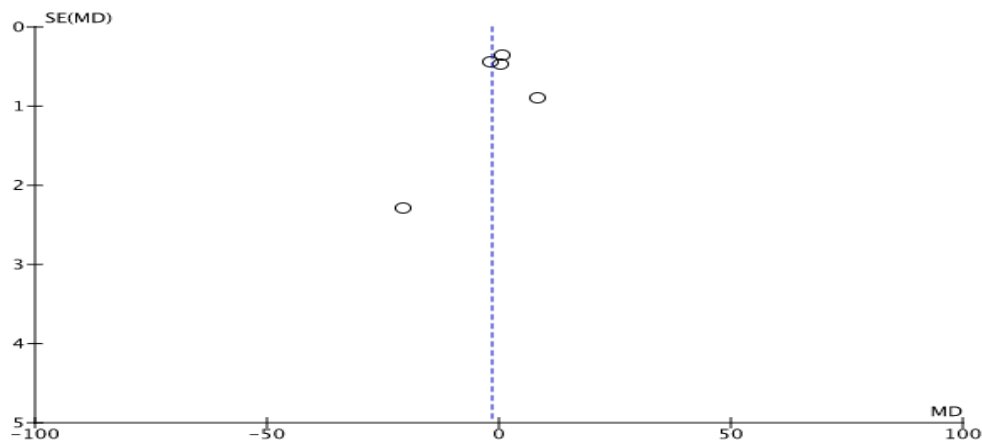
Image 4. Funnel plot

Based on Image 4, it shows that there is no publication bias which is indicated by the symmetry of the right and left plots, where 1 plot is on the right and 1 plot is on the left, and there are 3 plots that touch the center line. It can be said to be unbiased also because of the balance of the distance between the studies both between the right and left sides. The plot on the left of the graph has a standard error between numbers 2 and 3, while the plot on the right has a standard error between 0 and 01.

Discussion

Low back pain has become a common problem in global health which is mentioned in the journal Analysis of risk factors for depression among patients with chronic low back pain in an orthopedic clinic (Omoke and Igwe 2019). Low back pain itself can be caused by various things such as age, which was stated in the research of Nurzannah et al in 2015 with research results showing that the risk of low back pain in loading and unloading workers aged 25-65 years has a risk of 0.259 times greater compared to workers aged <25 years (Nurzannah, Sinaga, and Salmah 2015). In addition, the influence of years of service during activities both at work and in routine daily activities, such as research conducted by Rohmanwan and Hariyono in 2017 shows that someone who has worked for5 years have a higher risk of experiencing low back pain by 12.56 times greater than someone who has a working period of <5 years (Rohmawan and Hariyono 2017). So we need a tool to support the reduction of pain in the back of the back. As research conducted by Liza et al showed that there was a decrease in the average lower intensity in the intervention group after using the spinal cord belt(Liza, Ismail, and Huriah 2015).

The results of the systematic study and meta-analysis are presented in the form of forest plots and funnel plots. The forest plot shows an overview of information from each of the studies examined in the meta-analysis, and estimates of overall results. A funnel plot is a diagram in a meta-analysis commonly used to demonstrate possible publication bias. The funnel plot shows the relationship

between effect size and sample size or standard error of the effect sizes of the various studies studied (Murti, 2018).

Systematic review and the meta-analysis in this study was conducted with the aim of increasing the generalizability of the findings and obtaining convincing conclusions from the results of various similar studies regarding the use of back support (orthosis) -1.62 is better in reducing pain when compared to without using back support but with other treatments (non-orthosis), was statistically close to significant (ES= -1.62; 95% CI -5.02 to 1.78; p= 0.35) (Widiyanto, 2018). The results showed a reduction in pain. The heterogeneity of the research data shows I2 = 98% which indicates the distribution of heterogeneous data, so that the analysis uses a random effects model. Therefore, from the results of meta-analysis data, it is known that the use of back support (orthosis) has an effect on reducing the degree of pain in patients who experience back

Conclusion

Meta-analysis of 5 randomized controlled trial articles from 4 countries spread over 3 continents namely Iran, Spain, Sweden, and Texas concluded that the use of back support (orthosis) -1.62 is better in reducing pain in patients with non-specific back pain. compared with no back support orthosis, but not statistically significant (ES= -1.62; 95% CI -5.02 to 1.78; p= 0.35).

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