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The Effect of Physical Exercise on Depression State in Elderly People: Systematic Literature Review

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Abstract— Depression is a disorder that frequently develops, is more prevalent in the elderly, and is one of the leading causes of suicide. Additionally, one of the factors contributing to functional impairments, which are similar to chronic diseases, is depression. The purpose of this study was to investigate the types and doses of physical exercise that are useful for reducing depression symptoms in the elderly population. This study conducted a systematic review following the PRISMA statement and collected individual research studies from databases such as PubMed, Web of Science, Pedro, and google scholar. This Systematic Literature Review (SLR) of physical exercise with moderate intensity including aerobic exercise, strength exercise, multi-exercise program (MEP), and aquatic exercise was effective to reduce depression scores in healthy elderly and elderly without cognitive impairment. Additionally, exercise could improve the score of depression in the elderly with Major Depressive Disorder (MDD).

Keywords: Physical activity, Physical Exercise, Depression, Elderly, Geriatric

1. Introduction

Depression is an unpleasant emotional condition, which is characterized by subjective feelings such as tension, fear, and worry, and is also characterized by an active central nervous system. During the depression, the body releases the hormones cortisol and adrenaline which make the heart work faster. This hormone is able to release energy in vain so that you feel tired easily and the desire to end your life arises. Problems and events experienced by the elderly during the COVID-19 pandemic included the increasing number of elderly people who were detected as having a tendency to be depressed from 7.8% in 2018 to 25.43% in 2020 during the COVID-19 pandemic. An initial study on 364 elderly people in Cimandala Village, Bogor District, Province of West Java, Indonesia, showed that 72% experienced depression at a mild to severe level.

Based on research literature studies from several countries such as Canada, England, and Pakistan are all countries that experience depression overall, weakness in physical activity is associated with increased stress, anxiety, and depression. Data from the Canadian Longitudinal Study on Aging (CLSA), researchers found 43% of adults aged 50 years or more experienced moderate to high levels of depressive symptoms at the start of the Covid-19 pandemic and increased over time.

According to a number of research, depression levels are influenced by cognitive variables and

physical activity(1–4). In 2018, Hammen C stated that a number of elements, including cognitive, family conflicts, biology, interpersonal features, family support, social problems, and gender, contribute to depression. Age, race, education and birth characteristics all have an impact on depression ratings, according to research by Abraham LR from 2019.

Exercise is a type of physical activity that has a set dosage and a predetermined goal. Low to moderate doses can be administered to the geriatric population. The exercises range from simple strolling to group fitness sessions in a community to aquatic exercises. The advantages of this physical activity have been established, starting with physical health, which includes enhancing balance and lowering the chance of falling, as well as mental health. Based on this, this study seeks to investigate the types and doses of physical exercise that are useful for reducing depression symptoms in the elderly population.

2. Methods

This study was conducted using a systematic literature review, which construct 2 main points: Eligibility criteria and search strategy.

2.1 Eligibility Criteria

The eligibility criteria included: 1). The article which published in English 2). Published year around 2017-2022 or late 5 years 3). Outcome measure with all scales for geriatric depression 4). The population must be elderly people (age >60 years old) 5). The intervention was all types of physical exercise or physical activity 6). Article with clinical trial

2.2 Search Strategy

This study used Mendeley for management references and used the Boolean term to search in database libraries such as PubMed, Web of Science, Google Scholar, and Physiotherapy Database (PEDro). The PICO was applicated in the search engine using the keyword “Physical Exercise” OR “Physical Activity” AND “Depression” AND “Elderly” OR “Older People” OR “Geriatrics”. The study that didn't match the criteria for inclusion was then excluded. The whole text of the study that was chosen was downloaded and included in the study after the completion of the critical review. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2009 was used to report the analysis of the included study that was retrieved using the PICOS format (see Figure 1).

3. Result

3.1 Characteristics of Study

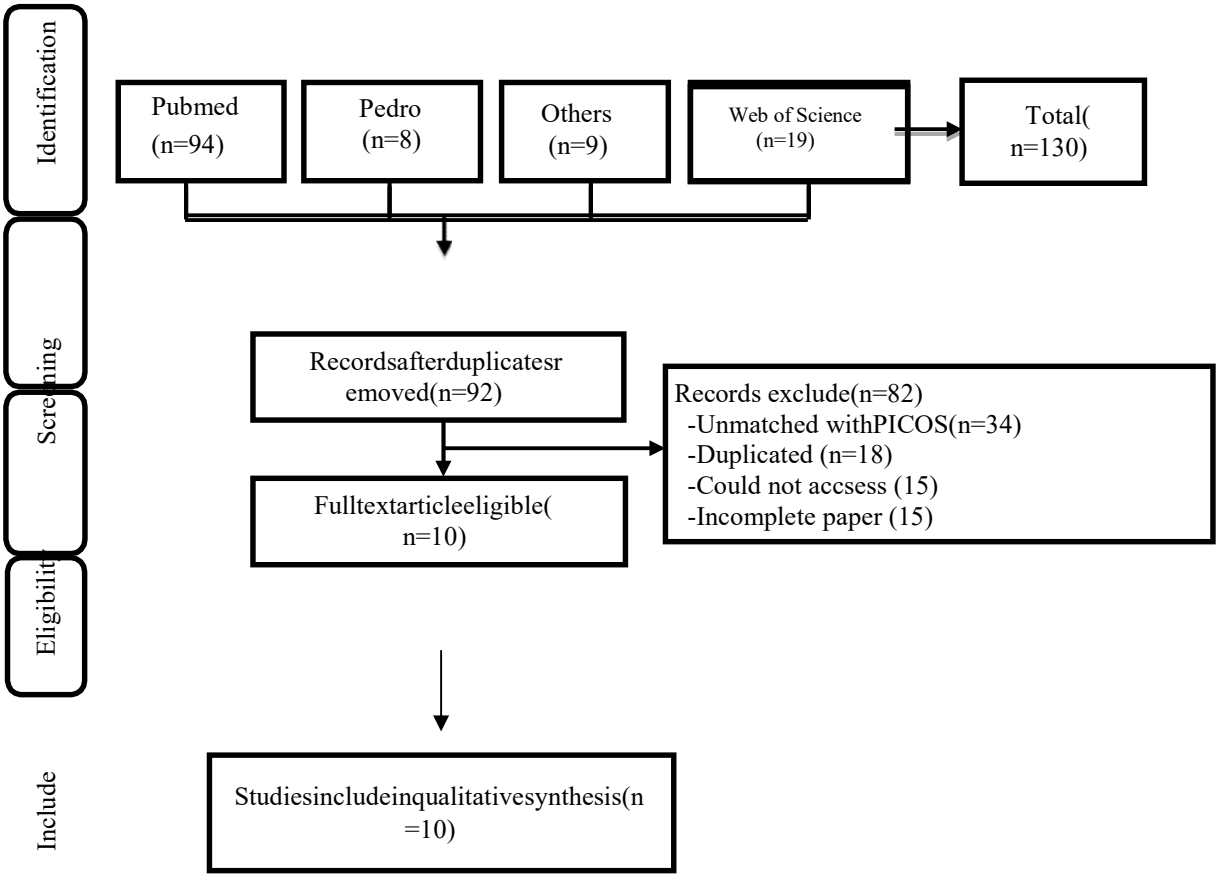
This study included 10 articles from a clinical study (randomized or non-randomized control trial) that measured Depression in elderly people. The published year between the latest 2016-2022 was conducted in Japan, Brazil, Turkey, Mexico, Brazil, Spain, and Australia. Furthermore, the total sample size included in this study was 901 elderly people. The participant mostly people with health conditions and without cognitive impairment. Otherwise, the participants also have been diagnosed with Major Depressive Disorder or Depression symptoms in some studies. This individual study reported several data set including the Health and Welfare Center of Okayama

Government, Center for Alzheimer and relate Disorder, the Institute of Psychiatry at the Federal University of Rio de Janeiro, the University hospital, internal of the most appropriate exercise program for each older patient, San Vincente de Paul retirement home Tijuana City in Mexico, Kaizuka City Welfare Center, Medical clinics psychiatric, Elderly Community Center in San Paulo in Brazil, 3 basic health area: Sant Joan de Vilatorada, Suria, Manresa, communities in the Illawarra region, NSW, Australia, Primary rural care center (Sollana and carcaixent) in Spain. (seeTable1).

3.2 The Various Type of Physical Exercise in Elderly People

The types of physical exercise in these studies such as aerobic exercise (bike, treadmill, walking), Multicomponent Exercise Program (Conditioning, strengthening, flexibility), aquatic exercise, basic exercise, and Thai yoga or Thai chi (see table 2. For details of interventions). All various exercises used moderate intensity(5,6) (around 40%-70% HRmax)(7–9) in the intervention group and low intensity or usual physical activity in the control group. Furthermore, most of the studies' exercise programs start from 12 weeks, and the others have 4 months, 6 months, and the longer one 12 months. Moreover, there is a study that has set patients during hospitalization for a minimum of 5 days with supervised exercise from physiotherapists.

Figure1.Flowchart ofstudyselectionprocess



3.3 Physical Exercise and Depression

In this review, the main outcome of measurements is the Status of Depression even though the scale might be different in the some of studies. The Depression scale in most studies uses Geriatric Depression Scale (GDS), Beck Depression Inventory (BDI), and two other measurements such as CES-D (Centre for Epidemiological Studies Depression) Questionnaireand Depressive state. The results in each study were various after intervention and mostly hadsignificant results to reduce depression status in healthy elderly in these measurements GDS ($p=0.01$)(5), Depressive State ($p=0.001$)(6)), or elderly without cognitive impairment GDS ($p<0.05$)(7), ($p=0.04$)(8,9), BDI ($p<0.01$)(10). Additionally, reduce depression state in the elderly who has diagnosed with Major Depressive Disorder with BDI results ($p=0.005$)(11) and ($p<0.05$)(12).

Table1.ArticlesCharacteristics

No	Author/Year	Country	Research method	Sample size	Participant	Data Set
1	Hishikawa,2019(5)	Japan	Prospective clinical study	385	Healthy elderly	Health and Welfare Center of Okayama Government,
2	Moraes, 2019(11)	Brazil	RCT	27	Major Depressive Disorder (MDD)	Center for Alzheimer and relate Disorder, Institute of Psyciatry at the federal University of Rio de Janeiro
3	Karapinar, 2022(7)	Turkey	RCT	124	Patient with no cognitive problem (MMSE >24)	University hospital, internal of the most appropriate exercise program for each older patient
4	Ortiz, 2019(6)	Mexico	Clinical trial	50	Older people in the retirement home	San Vincente de Paul retirement home, Tijuana City, Mexico
5	Imaoka, 2019(13)	Japan	RCT	67	Healthy Elderly	Kaizuka City Welfare Center
6	Da Silva, 2019(12)	Brazil	RCT	30	- MDD - Healthy Elderly	Medical clinics psychiatric
7	Alabarse, 2019(9)	Brazil	RCT	69	Elderly with depressive symptoms and good	Elderly Community Center in San Paulo, Brazil

					quality of life	
8	Ruiz, 2022(10)	Spain	Clinical multicenter randomized trial	20	Patient without cognitive impairment or MDD	3 basic health area: - Sant Joan de Vilatorada - Suria - Manresa
9	Noradechanunt, 2016(14)	Australia	RCT	29	Healthy elderly	communities in the Illawarra region, NSW, Australia
10	Tarazona, 2016(8)	Spain	RCT	100	Older people without cognitive impairment	Primary rural care center (Sollana and carcaixent) in Spain

**Abreviation: RCT (Randomized Control Trial),*

Table 2. Details of Physical Exercise in Elderly People

No	Author/Year	Intervention Group	Details of the intervention group	Program Periods	Significant results
1	Hishikawa,2019(5)	Yoga, dry massage, aerobic exercise, stimulation of pressure point	This intervention is a mixed exercise included: 15 minutes program consisting of yoga (e.g., body posing and breathing), dry massage (whole body, particular head and ears), aerobic exercise and stimulation of pressure point. This intervention recorded into dvd and the participant watching this recorded in the national television. There are 3 groups participant: 1. Health &walfare Center (n=84) : 1x/week with instructor. And exercise by them self in the other day. 2. The day service center (n=89) : 2x/week with instructor 3. Nursing home (n=12) : daily with instructor.	12 months	GDS(p=0.01)
2	Moraes, 2019(11)	Aerobic exercise (bike,	1. AT: 30 min (moderate intensity), exercise with	12 weeks	BDI AT vs CG

		treadmill), Techno gym,	stationary bikes or treadmill. 2. ST: 30 min (moderate intensity), exercise for major group using techno gym (the chest (chest press), back (low row), quadriceps (leg extention), ischium (leg curl)). 3. CG: 30 min (low intensity), the same with AT or ST.		(p=0.005) ST vs CG (p=0.007)
3	Karapinar, 2022(7)	Aerobic exercise	Details of exercise: 40 min/ session/day, 5x/ week, each session include 5 min warm up, 15 min tailored strength and flexibility, 15 min balance, and 5 min cool down. IG: supervised exercise program + usual care CG: unsupervised exercise program +usual care	During patient hospitalization (minimum 5 days)	GDS ($p<0.05$) both group.
4	Ortiz, 2019(6)	Physical activity	Frequency: 5x/week Time: 40-50 min/session Intensity: moderate (3-6 METs) IG: Chair exercise, 10 min warm up, 25 min main physical conditioning, 10 min cool down CG: Passive physical activity (watching TV, sit and talk, sleep and pray in the chapel)	12 weeks	Depressive Score ↓ p=0.001
5	Imaoka, 2019(13)	Exercise + nutrition and exercise only	IG: Exercise + nutrition CG: Exercise Frequency: 1x session/week Time: 60 min/session Type: 15 min memory training, 45 min aerobic exercise (self-stretching 10 min, aerobic	3 months	GDS p=0.44 between group

			exercise regimen 15 min, conditioning 10 min)		
6	Da Silva, 2019(12)	Aquatic exercise	IG: aquatic training, water dept 120cm, water temperature 26-28 degreesCelcius CG: exercise large muscle group, intensity 50-60% HRmax Frequency: 2x/weeks Time: 45 min/session	12 weeks	BDI p<0.05 in the depression group
7	Alabarse, 2019(9)	Treadmill	IG: walking training Frequency: 3x/week Intensity: 50-70% HRmax Time: 40 min CG: usual activities	12 weeks	GDS p=0.04
8	Ruiz, 2022(10)	Aerobic Physical activity	IG: aerobic physical activity program (walking), 3 METs Frequency: 2x/week CG: usual care at primary care	4 months	BDI p<0.01
9	Noradechanunt, 2016(14)	Thai yoga or thai chi	IG: Thai Yoga or Thai Chi Frequency: 2x/weeks Time: 80 min/session CG: Telephone supervised exercise (increase home-based physical activity)	12 weeks	CES-D: TY vs C: p=0.925 TC vs C: 0.939 TY vs TC: p=0.999
10	Tarazona, 2016(8)	Multicomponent Exercise Program (MEP)	IG: Multicomponent Exercise Program included proprioception and balance (postural sway and dynamic balance, coordination, and flexibility of the lumbopelvic area), Aerobic exercise 40-60% HRmax (walking around a circuit and climbing stairs), Strength training 25-75% 1 Repetition Maximum (performed with resistance bands and included isometric,	24 weeks	GDS: IG vs CG after intervention(p=0.04)

			concentric, and eccentric exercises with arms, hands, and legs), stretching (arms, legs, and neck). Frequency: 5x/week Time: 65 min CG: N/A		

**abbreviation: IG (Intervention Group), CG (Control Group), GDS (Geriatric Depression Scale), BDI (Beck Depression Inventory), CES-D (Centre for Epidemiological Studies Depression) Questionnaire, N/A not applicable;HRmax (Heart Rate Maximum)*

4. Discussion

4.1 Articles of Characteristics Study

Penelitian ini mendeskripsikan intervensi latihan fisik terhadap lansia untuk meningkatkan aktifitas fisik dan menurunkan gejala depresi pada lansia sehat atau tanpa gangguan kognitif dan menurunkan skor depresi pada lansia yang telah didignosa MDD. Selain itu terdapat berbagai macam setting penelitian dari masing-masing artikel yang terdiri dari rumah pensiun lansia, pasien yang masih mendapat perawatan dari rumah sakit atau Mexicoprimary care, dan health and welfare center. Penelitian terbanyak dilakukan di negara Brazil, Spain, Japan,

These results of this study describe the knowledge and practiced of Birth Preparedness and Complication Readiness includes the factors influencing of Birth Preparedness. The most common study conducted in Africa country such as Nigeria, Ethiopia, Cameroon and other countries Uganda, Tanzania, Nepal, and Rwanda. The factors of BPCR practice reported from the significant results in each individual study of cross-sectional study, then could not report the variable which did not have significant relations. Several studies reported by percentage, but there is one study which report mean of scoring in knowledge of BPCR. Furthermore, this study focuses on Rural Area, and did not show other advanced/wealth country. BPCR exposure related the practiced of that, there are only few studies then there is one systematic review which coverage related factor in Ethiopia Country and describe that the prevalence case of childbirth at home was high. Otherwise, it also coverage that maternal mortality because in they are in the rural area which have the characteristic of the socio demographic such as few chances to get education, difficult to getting information, having problem to earn money, and less ANC attendance.

4.2 Physical Exercise in Elderly People

Most of the cross-sectional studies above, reported the presentation of knowledge of BPCR on each indicator, while the other studies did not report the presentation of readiness to give birth with preparation for BPCR. In addition, one other study reported mean scores from knowledge of BPCR and childbirth-related factors. In practice, most of the studies reported the percentage of delivery attendance by full BPCR (mean of total BPCR indicators). However, there is a study conducted by Smeele, 2018 which reports details of the BPCR practice of each identified health facility (19.4%), transportation arrangements (21.7%), money saved (87.4%), labor skilled birth attendant (13.1), Number of steps taken (22.3%).

4.3 Physical Exercise and Depression

The incidence of parity and the presence of ANC are the most found factors and have significant results on childbirth readiness. In addition, the other factors described above also contribute to the readiness to give birth. However, it should be noted that the results of this study were mostly obtained in rural areas in African states, so further studies are needed from other developing countries in Asian countries.

5.Expected Further Research

Based on the articles found in this study, it is hoped that there will be a longitudinal study to determine the interaction between variables in BPCR. This cross-sectional study is the starting point to be able to carry out continuous research such as observational studies and continue to design appropriate intervention designs for prevention as well as overcome the problems of the factors that have been studied in the current study.

6. Study Limitation

This study onlydescribes the results of physical exercise in depression scores and did not synthesizeother results such as physical or quality of life. This study limits the design of a clinical study or clinical trial, so the results or factors related to depression and physical activity are limited. Also, the reporting of each individual study appears inconsistent because of various settings.

7. Conclusion

In the last 5 years, research has been limited to factors related to childbirth preparation and BPCR practice and knowledge. However, the results of this study can be used as a basis for further studies related to BPCR interventions in other developing countries, especially Indonesia. Furthermore, the findings of this study found that the most common factors related to birth preparedness were parity rate and prenatal attendance or ANC.

8. References

[1] Lee K, Jeong GC, Yim J. Consideration of the psychological and mental health of the elderly during COVID-19: A theoretical review. Vol. 17, International Journal of Environmental Research and Public Health. MDPI AG; 2020. p. 1–11.

[2] Douglas H, Georgiou A, Westbrook J. Social participation as an indicator of successful aging: An overview of concepts and their associations with health. Australian Health Review. 2017;41(4):455–62.

[3] Loyola WS, Camillo CA, Torres CV, Probst VS. Effects of an exercise model based on functional circuits in an older population with different levels of social participation. GeriatrGerontol Int. 2018 Feb 1;18(2):216–23.

[4] Sepúlveda-Loyola W, Rodríguez-Sánchez I, Pérez-Rodríguez P, Ganz F, Torralba R, Oliveira D v., et al. Impact of Social Isolation Due to COVID-19 on Health in Older People: Mental and Physical Effects and Recommendations. Journal of Nutrition, Health and Aging. 2020;

[5] Hishikawa N, Takahashi Y, Fukui Y, Tokuchi R, Furusawa J, Takemoto M, et al. Yoga-plus exercise mix promotes cognitive, affective, and physical functions in elderly people. Neurol Res. 2019 Nov 2;41(11):1001–7.

[6] Ortiz-Ortiz M, Gómez-Miranda LM, Chacón-Araya Y, Moncada-Jiménez J. Effects of a physical activity program on depressive symptoms and functional capacity of institutionalized mexican older adults. Journal of Physical Education and Sport. 2019 May 1;19:890–6.

[7] Karapınar M, Kırdı N, Fırat T. Effectiveness of supervised and functional level-based exercise program in elderly inpatients: Randomised controlled trial. Clin Rehabil. 2022 Dec 1;36(12):1623–34.

[8] Tarazona-Santabalbina FJ, Gómez-Cabrera MC, Pérez-Ros P, Martínez-Arnau FM, Cabo H, Tsaparas K, et al. A Multicomponent Exercise Intervention that Reverses Frailty and Improves Cognition, Emotion, and Social Networking in the Community-Dwelling Frail Elderly: A Randomized Clinical Trial. J Am Med Dir Assoc. 2016 May 1;17(5):426–33.

[9] Alabarse SL, Coelho Júnior HJ, Asano RY, Luna Filho B, Santos WC, Oliveira Filho JA. Moderate-Intensity Walking Training Improves Depressive Symptoms and Pain in Older Adults with Good Quality of Life: A Controlled Randomized Trial. International Journal of Cardiovascular Sciences. 2019;

[10] Ruiz-Comellas A, Valmaña GS, Catalina QM, Baena IG, Mendioroz Peña J, RouraPoch P, et al. Effects of Physical Activity Interventions in the Elderly with Anxiety, Depression, and Low Social Support: A Clinical MulticentreRandomised Trial. Healthcare. 2022 Nov 2;10(11):2203.

[11] Moraes HS, Silveira HS, Oliveira NA, Matta Mello Portugal E, Araújo NB, Vasques PE, et al. Is Strength Training as Effective as Aerobic Training for Depression in Older Adults? A Randomized Controlled Trial. Neuropsychobiology. 2020 Feb 1;79(2):141–9.

[12] da Silva LA, Tortelli L, Motta J, Menguer L, Mariano S, Tasca G, et al. Effects of aquatic exercise on mental health, functional autonomy and oxidative stress in depressed elderly individuals: A randomized clinical trial. Clinics. 2019;74.

[13] Imaoka M, Nakao H, Nakamura M, Tazaki F, Maebuchi M, Ibuki M, et al. Effect of multicomponent exercise and nutrition support on the cognitive function of older adults: A randomized controlled trial. Clin Interv Aging. 2019;14:2145–53.

[14] Noradechanunt C, Worsley A, Groeller H. Thai Yoga improves physical function and well-being in older adults: A randomised controlled trial. J Sci Med Sport. 2017 May 1;20(5):494–501.