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The Effectiveness of Core Stability Exercise Toward the Beta-Endorphin Hormon Level of Postpartum Mothers

Efektivitas Core Stability Exercise terhadap Level Hormon Beta-Endorfin pada Ibu Pasca Persalinan

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ABSTRACT

Background: Postpartum mothers experience a drop in beta-endorphin levels on day 4. Beta-endorphins play an important role in analgesics, milk production, and preventing postpartum depression.

Objective: This study aimed to determine the effectiveness of core stability exercise on the level of beta-endorphin hormones in postpartum mothers.

Methods: The research design used a pretest and posttest controlled group design. Involving 42 respondents, namely postpartum mothers at Halmahera and Ngesrep Health Centers, Semarang. Respondents were divided into 2 groups equally by simple random sampling, namely: experimental group (core stability exercise) and control group (postpartum exercise). Then the effect before and after the intervention on beta-endorphin hormone levels will be seen by controlling anxiety scores. Analysis using independent T test and MANCOVA.

Results: The mean increase in beta-endorphin hormone level in the experimental group was 140 ng/ml, while in the control group it was 43.1 ng/ml. Core stability exercise is more effective for increasing beta-endorphin hormone levels after controlling anxiety compared to postpartum exercise with a p value of 0.023.

Conclusion: Core stability exercise is effective in increasing beta-endorphin hormone levels in postpartum mothers. This research serves as a guideline for midwives to apply core stability exercise when providing midwifery care to postpartum mothers.

Keywords: beta-endorphin; core stability exercise; postpartum

ABSTRAK

Latar Belakang: *Ibu pasca persalinan mengalami penurunan level hormon beta-endorfin pada hari ke-4. Hormon beta-endorfin berperan penting sebagai analgesik, produksi ASI, dan mencegah terjadinya depresi pasca persalinan.*

Tujuan*: Penelitian bertujuan untuk mengetahui efektivitas core stability exercise terhadap level hormon beta-endorfin pada ibu pasca persalinan.*

Metode: *Desain penelitian menggunakan pretest and posttest controlled group design. Melibatkan 42 responden yaitu ibu pasca persalinan di Puskesmas Halmahera dan Ngesrep, Semarang. Responden dibagi menjadi 2 kelompok sama rata dengan simple random sampling yaitu : kelompok eksperimen (core stability exercise) dan kelompok kontrol (senam nifas). Kemudian akan dilihat pengaruhnya sebelum dan sesudah intervensi terhadap level hormon beta-endorfin dengan mengendalikan skor kecemasan. Analisis menggunakan independent T test dan MANCOVA.*

Hasil *Rerata kenaikan level hormon beta-endorfin pada kelompok eksperimen yaitu 140 ng/ml, sedangkan pada kelompok kontrol adalah 43.1 ng/ml. Core stability excercise lebih efektif untuk meningkatkan level hormon beta-endorfin setelah mengendalikan kecemasan dibandingkan dengan senam nifas dengan nilai p 0,023.*

Kesimpulan: *Core stability exercise efektif meningkatkan level hormon beta-endorfin pada ibu pasca persalinan. Penelitian ini sebagai pedoman bidan untuk menerapkan core stability exercise saat memberikan asuhan kebidanan pada ibu pasca persalinan.*

Kata Kunci: *beta-endorfin; core stability exercise; pasca persalinan*

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INTRODUCTION

The beta-endorphin hormone decreases on day 4 in postpartum women which provides an analgesic effect by binding to μ-opioids. This interaction prevents the release of Gamma-aminobutyric Acid (GABA), inhibits neurotransmitter activity, and stimulates the production of dopamine, known as the happiness hormone (Litwack 2022). The analgesic effect makes postpartum mothers not feel afterpains or pain due to the process of uterine involution (Karimah, Supriyana, Sumarni, et al. 2022), pain due to perineal wound sutures (Karimah, Khafidhoh, Hardjanti, et al. 2019), pain due to cesarean section sutures, and pain due to breastfeeding the baby for the first time (Kartal, Kaya, Yazici, et al. 2022).

The beta-endorphin hormone secreted into the bloodstream will stimulate the let down reflex through the mechanism of increasing the secretion of the amount of prolactin and oxytocin hormones by the anterior pituitary which supports the process of producing and releasing breast milk (Lestari, Rahmawati, Windarti, et al. 2019). The exclusive breastfeeding rate in Indonesia in 2022 (67.96%) has decreased compared to 2021 (69.7%). The causes of mothers not exclusively breastfeeding are very complex, such as working, poor milk production, low knowledge of the importance of breast milk for babies, no early initiation of breastfeeding (IMD) and no husband support (Salamah & Prasetya 2019). Breast milk is a living liquid that is full of nutrients for babies and can strengthen the baby's immune system (WHO 2023).

Beta-endorphins are important in preventing postpartum depression by improving mood, resulting in improved body condition. The prevalence of postpartum depression globally each year is around 10-15% or 500,000 people (Guintivano, Manuck & Meltzer-Brody 2018). The prevalence of postpartum depression in Indonesia in 2021 is 27% (I-NAMHS 2022). Postpartum depression can reduce breast milk production through an increase in the hormone cortisol (stress hormone) which suppresses the secretion of prolactin and oxytocin hormones (Ahmadinezhad, Karimi, Abdollahi, et al. 2024), and can make postpartum mothers hurt themselves and their babies.

The hormone beta-endorphin is a neuropeptide composed of 31 amino acids produced in the body by the hypothalamus and pituitary when a person feels comfortable. Postpartum mothers who receive emotional, physical, and psychological support from their husbands will feel comfortable and reduce stress, then their bodies will respond by increasing levels of beta-endorphins (Lowdermilk, Cashion, Alden, et al. 2023). In addition, doing enjoyable activities can also increase beta-endorphin levels such as doing hobbies, consuming favorite foods, cuddling the baby, massage, and exercise. Beta-endorphins are released when the body is experiencing pain, discomfort, depression, bad mood, when appetite decreases, and breastfeeding. These are some of the benefits of beta-endorphins to the body (Litwack 2022).

The beta-endorphin hormone has a very important role for postpartum and breastfeeding mothers and can be stimulated through exercise. The type of exercise recommended for postpartum mothers is postpartum exercise. Pelvic floor muscle exercises or known as postpartum exercises are proven to strengthen the pelvic floor muscles after childbirth and reduce incontinence symptoms (KEMENKES 2018).

Postpartum exercises can increase blood circulation, improve postpartum posture, and strengthen the back, pelvic floor and abdominal muscles. However, puerperal exercises cannot activate the transversus abdominis, erector spinae and

oblique muscles needed to improve spinal stability (Yuliarti 2010). Therefore, core stability exercise has been shown to reduce pain intensity in patients with chronic non-specific low back pain (Zheng, Liu, Yin, *et al.* 2024).

Postpartum mothers will undergo their new role as mothers, namely taking care of their newborn babies, so mothers will be busy breastfeeding babies, bathing babies, and changing baby clothes that are wet from urine or feces. This is very time-consuming, so care or intervention for postpartum mothers is carried out through home visits or homecare. Core stability exercise can be done in a class together or individually (Karimah, Afriannisyah, Ropitasari, et al. 2024).

Core stability exercise is an exercise that activates the 'core' muscles, namely the transversus abdominis and multifidus. Both muscles are continuously modulated by the central nervous system and provide feedback regarding joint position. The transversus abdominis muscle begins to contract 30 milliseconds before limb movement occurs, while the multifidus muscle contracts within 110 milliseconds. In individuals with low back pain, this neuromuscular response is delayed. As a result, the transversus abdominis and multifidus muscles have difficulty forming spinal stability before movement (Karimah, Afriannisyah, Ropitasari, et al. 2024).

Core stability exercises aim to create stability in the proximal body parts to allow optimal distal movement. This continuous movement pattern helps protect the distal joints as the body moves (Norris 2023). Body stability is maintained through interactions between three subsystems, namely the nervous subsystem (including the central and peripheral nervous systems), the passive subsystem (which includes bones, ligaments, and joints), and the active subsystem (involving muscles and tendons). These three systems work synergistically to control spinal movement and stability (Wang, Zheng, Yu, et al. 2012).

Until now, there has been no research that specifically evaluates the effectiveness of Core stability exercise for postpartum mothers. Therefore, this study aims to determine the effectiveness of core stability exercise on beta- endorphin hormone levels in postpartum mothers. This research is expected to be a guideline for midwives to apply core stability exercise when providing midwifery care to postpartum mothers.

MATERIALS AND METHODS

A. Research Design

This study uses a pure experimental design with pretest and posttest methods in controlled groups. Respondents were divided into two groups: the experimental group received core stability exercise treatment and the control group performed puerperal exercises. Each respondent received the intervention with a frequency of three times per week, 45 minutes per session, for 1 month.

The independent variables in this study are core stability exercise and postpartum exercise, while the beta-endorphin hormone level is the dependent variable. Anxiety is a confounding variable. This study was conducted in February-March 2020 at Halmahera Health Center and Ngesrep Health Center, Semarang City.

B. Population and Sample

The target population in this study were all postpartum mothers in Halmahera Health Center and Ngesrep Health Center, Semarang City. The number of samples in this study was calculated based on the probability of outcome as 42 respondents which were divided into 2 groups equally. Samples used as respondents in this study must meet the inclusion criteria, namely postpartum mothers 0-3 months, age between 20-35 years, history of vaginal delivery, body mass index < 27 Kg/m^2.

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While the exclusion criteria in this study are taking analgesic drugs, suffering from diseases, and not willing to become respondents.

The sampling technique uses simple random sampling by means of respondents taking the lottery numbers provided randomly. There are 2 lottery numbers, namely lottery number 1 (experimental group) and lottery number 2 (control group). The lottery number is taken by the respondent randomly and the respondent will be categorized in the group according to the selected lottery number.

C. Data Retrieval Technique

This study has obtained permission from the Bioethics Commission for Medical/Health Research, Faculty of Medicine, Sultan Agung Islamic University Semarang as listed in Ethical Clearance with number 023/I/2020/Bioethics Commission All postpartum mothers involved have given informed consent.

Data collection in the form of beta-endorphin hormone levels and anxiety scores were carried out before giving the intervention (pretest). Furthermore, they will follow core stability exercise (in the experimental group) and postpartum exercise (in the control group) for 1 month. Then the data will be taken again after the end of the intervention (posttest) in each group.

D. Research Instrumens

The pretest was conducted by taking a saliva sample of 1 cc and the posttest was conducted by taking a saliva sample of 1 cc after the last meeting, namely the 12th meeting. Then the saliva samples were taken to the Diponegoro University GAKY Laboratory to be stored until the sample was fulfilled, then the examination of beta-endorphin hormone levels using the ELISA (Enzymed Linked Immunosorbent Assay) method also through the laboratory. Anxiety scores will be examined using a valid PASS (Perinatal Anxiety Screening Scale) questionnaire. PASS is an instrument used to detect various symptoms of anxiety during pregnancy and postpartum. PASS consists of 31 items that are easy to complete, have high sensitivity in detecting anxiety and can be used in various situations.

E. Data Analysis Technique

Univariate analysis was used to describe respondents' characteristics (age, parity, and anxiety score), independent variables (core stability exercise and postpartum exercise), and dependent variable (beta-endorphin hormone level). Bivariate analysis was used to determine the effect of core stability exercise and postpartum exercise on increasing beta-endorphin levels. Before carrying out the bivariate test, first conduct a data normality test with the results of the difference between pretest and posttest beta-endorphin hormone levels and anxiety scores normally distributed (p value> 0.05) using the Shapiro wilk test because the number of samples is less than 50 (Table 1). So bivariate analysis was carried out using a parametric test, namely the independent T test.

Table 1. Results of Normality Test Data

No.	Variables	Group	n	Average	Value of p^a	Data Distribution
1	Beta-endorphin hormone levels	Experiment	21	3,36	0,667	Normal
		Control	21	8,89	0,760	Normal
2	Anxiety score	Experiment	21	9,40	0,691	Normal
		Control	21	6,42	0,952	Normal

[a]Shapiro-Wilk: Test of normality, level of significance sig>0.05*

Multivariate analysis using the MANCOVA test. This test is conducted to control for confounding factors that become covariates or accompanying variables that cannot be separated. In this case, the anxiety variable qualifies as a covactor with a Pearson correlation test that has been tested on the dependent variable. Data were analyzed using the SPSS 22.0 program.

RESULT AND DISCUSSION

A. Research Results

The characteristics of respondents in this study were analyzed using univariate methods, which included the mean, minimum value, and maximum value of age, parity and anxiety. Prior to the intervention, a homogeneity test of characteristics was conducted to ensure similarity of variance between groups by applying the Lavene test.

Health workers, especially midwives, can be promoted core stability exercise as excellent service with the best quality when providing midwifery care to postpartum mothers. Future research is expected to use biomarkers, namely the hormone cortisol so that the results are more accurate in measuring anxiety scores, thus minimizing subjectivity.

Table 2. Respondent Characteristics

No.	Characteristics	Experiment			Control			Value of p^a	Value of p^b
		Average	Min	Max	Average	Min	Max		
1	Age	24,16	19	36	26,11	19	39	0,557[a]	0,970
2	Anxiety	25,16	16	40	28,42	10	28	0,419[a]	0,185

[a]*Levene Test: Homogeneity of variances, *level of sig>0.05*
[b]*Independent T Test, level of sig>0.05*

Table 2 shows that respondents in the experimental group had an average age of 24 years and an anxiety score of 25.16. Meanwhile, respondents in the control group had an average age of 26 years and an anxiety score of 28.42. The characteristics of respondents in the form of age and anxiety in both groups are homogeneous or do not show significant differences in means (p value> 0.05).

Table 3. Parity Status of Respondents

No.	Characteristics		Experiment		Control	
			f	%	f	%
1	Parity	Primiparous	1	5	0	0
		Multiparous	20	95	21	100

Table 3 shows that the parity status of the respondents in this study was mostly multiparous in both the experimental (95%) and control (100%) groups. Table 4 shows that the mean level of beta-endorphin hormone before intervention (pretest) in the experimental group was 86.26 ng/ml, while in the control group it was 182 ng/ml. The results of the homogeneity test showed that both groups had homogeneous beta-endorphin hormone levels or showed no significant difference in mean (p value > 0.05).

Table 4. Results of Homogeneity Test of Mean Beta-endorphin Hormone Level Before Intervention

No.	Variables	Group	Average
1	Beta-endorphin level	Experiment	86,26
		Control	182
		P-value	0,101[a]

[a]*Levene Test: Homogeneity of variances*
**level of sig >0.05*

Based on table 5, the calculated T value is 4.87. The p value of the gain score of beta-endorphin hormone levels in the

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experimental and control groups is 0.004 (< 0.05), so the hypothesis decision is to accept H1, which means that there is a significant difference in pretest and posttest beta-endorphin hormone levels between the experimental and control groups.

Table 5. Beta-endorphin Hormone Level Score Gain

No.	Group		Average	Value p^a	Value of p^b	Delta Mean
1	Experiment	*Pre test*	1,2	0.021[a]	0.004[b]	7,01
		Post test	1.9			
2	Control	*Pre test*	1.6	0.790[a]		4,8
		Post test	1.6			

[a]*Paired sample T test, *level of significance sig < 0.05*
[b]*Independent T test, *level of significance sig < 0.05*

Table 6. Correlation Analysis of Anxiety Score Gain with Beta-Endorphin Hormone Levels

No.	Variables	Value of p^a	*Pearson Correlation*[b]
1	Anxiety-hormone beta-endorphins	0,0001[a]	0,882[b]

[a]*Pearson Correlation Test * level of sig < 0.05*
[b]*Pearson Correlation * level of sig > r table* 0.320

Table 6 is the result of Pearson correlation analysis. It is known that the significant value between anxiety variables and beta-endorphin hormone levels has a p value of 0.0001 <0.05, which means there is a correlation between these variables. It is known that r count of 0.882 is greater than r table which is 0.320 (r count> r table), so it is concluded that there is a relationship between anxiety variables and beta-endorphin hormone levels.

Table 7 shows the difference in beta-endorphin level gain between the experimental and control groups after controlling for anxiety covariate. The p value of roy's largest root is 0.023 (<0.05), which means that in general, there is a significant effect between the different treatments in the experimental group and the control group on the level of beta-endorphin hormones simultaneously after controlling for postpartum maternal anxiety.

Based on Multivariate analysis of covariance: Tests of Between-Subjects Effects, for the effect of the covariate variable anxiety on the level of beta-endorphin hormone, the p value is 0.007 (<0.05), which means that there is an effect of anxiety as a covariate variable on the level of beta-endorphin hormone.

Table 7. Difference in Gain Score of Beta Endorphin Hormone Level with Controlling Anxiety

No.	Variables	Group	Average	*P-value*		
				Roy's Largest Root	Group	Covariance Anxiety
1	Beta-endorphin level	Experiment Control	140 43,1	0,023[a]	0,749[b]	0,007[b]

[a]*MANCOVA, level of sig <0.05*
[b]*MANCOVA: Tests of Between-Subjects Effects, level of sig<0.05*

Based on Table 7, the mean value of the increase in beta-endorphin hormone level in the intervention group is 140 ng/ml, while in the control group it is 43.1 ng/ml, which means that the intervention in the form of core stability excercise has a greater effect on increasing the level of beta-endorphin hormone compared to postpartum gymnastics.

Based on this description, the conclusion of the MANCOVA test analysis results is that core stability exercise is

effective for increasing the level of beta-endorphins after controlling anxiety in postpartum mothers.

B. Discussion

1. Respondent Characteristics

The average age of respondents in this study was 24 years in the experimental group and 26 years in the control group. This age is included in the healthy reproductive category of 20-35 years. Healthy reproductive age is related to the hormone beta-endorphin. Beta-endorphin hormones play an important role in the reproductive system. Therefore, at a healthy reproductive age, the level of beta-endorphins is in an optimal condition parity status in both groups was mostly multiparous (Seshadri, Morris, Serhal, et al. 2021; Chronopoulou, Raperport, Serhal, et al. 2021).

Parity is the total number of live births a woman has had. The safe parity status for mother and baby is parity status 2-3. Parity status of 1 or more than 3 is risky for both mother and fetus. Therefore, the parity status in this study is considered safe (Yusuf 2022). Parity status can affect postpartum maternal beta-endorphin levels, where primiparous mothers tend to have higher levels in response to greater stress and pain during first labor (Karimah, Afriannisyah, Ropitasari, et al. 2024).

The average anxiety score in this study was 25.16 in the experimental group and 28.42 in the control group. Respondents in this study were in the mild-moderate anxiety category (Barone, Cuniberti & Perna 2022).

2. Gain Score Analysis of Differences in Beta-endorphin Hormone Levels

Beta-endorphins are chemicals secreted by the pituitary gland in response to stress or pain, they bind to opioid receptors on neurons and block the release of neurotransmitters. This then interferes with the transmission of pain impulses to the brain. Exercise is physical exercise that stimulates the release of beta-endorphins 30 minutes from the start of activity (Lowdermilk, Cashion, Alden, et al. 2023).

The anterior pituitary gland functions to store and synthesize the hormone beta-endorphin which is quite abundant, has immune stimulation, stress suppressant activity, reduces pain, and anti-inflammatory. The action of beta-endorphins is similar to that of endogenous morphine as a holistic preventive measure without any side effects to the body (Suri, Sharma & Saini 2017).

This study examined beta-endorphin hormone by ELISA method using saliva samples taken in the morning. Hormones can enter saliva through the blood vessels surrounding the salivary glands. In the past decade, saliva has been widely used as a diagnostic fluid in various studies because it has several advantages over serum. These advantages include being non-invasive (does not cause tissue damage) and allowing self-sampling without the need for special training. The cost of the examination is relatively cheap and makes respondents less stressed because they are worried about injections (Pfaffe, White, Beyerlein, et al. 2011).

The results of this study showed a significant difference between the experimental group and the control group in the level of beta-endorphin hormone. The mean increase in beta-endorphin

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hormone level in the experimental group was 7.0142 ng/ml, while in the control group it was 4.8189 ng/ml. Therefore, the mean increase in beta-endorphin hormone level in the group given core stability exercise was higher than in the group given postpartum exercise.

Beta-endorphin hormone levels after being given core stability exercise treatment increased significantly, this is in line with other studies that show exercise is a feasible preventive or additional treatment to improve mental well-being such as alleviating symptoms of anxiety, depression, pain and stress (Mikkelsen, Stojanovska, Polenakovic, et al. 2017). In addition, physical exercise can also increase beta-endorphins and decrease cortisol (Hildebrandt et al., 2014; Robinson and Balasundaram, 2018; Yadav et al., 2012).

3. **Effectiveness of *Core Stability Exercise* and Postpartum Gymnastics on Beta-endorphin Hormone Levels**

After the anxiety covariate was controlled, the final result was different, namely there was a direct effect between core stability excercise and postpartum exercise on beta-endorphin hormone levels (p value 0.023). Based on this explanation, the conclusion of the MANCOVA test analysis is that core stability excercise intervention is more effective in increasing beta-endorphin hormone levels after controlling anxiety compared to postpartum exercises.

When the beta-endorphin hormone increases as a result of core stability exercise, anxiety scores also decrease. In line with Mohammed emran's research (2017) kinesiotape and postural correction exercises are recommended as effective methods compared to exercise alone for alternative therapy in treating postpartum mothers who experience back pain this is supported by a decrease in pain intensity using the VAS measuring instrument tested on mothers (Mohamed, El-Shamy & Hamed 2018).

This study is in line with previous research suggesting that physical interventions in postpartum mothers are effective in reducing back pain. Physical activity training based on the BASNEF (Beliefs, Attitudes, Subjective Norms, and Enabling Factors) model can be effective in promoting physical activity in the postpartum period, therefore, it is recommended that physical exercise accompanied by educational programs be applied to all these mothers in the postpartum period (Bashirian et al., 2020; Thabet and Alshehri, 2019).

During pregnancy, the abdominal muscles are gradually stretched as the gestational age increases. This leads to a decrease in muscle tone, which becomes more noticeable in the postpartum period. As a result, the abdominal wall weakens and the strength of the abdominal muscles decreases. Postpartum exercises focus on the abdominal muscles and pelvic muscles (Rahmaniar, Halik, Purnamasari, et al 2019).

Core stability exercise covers the abdominal trunk to the lower part of the torso. The muscles in this area include the Gluteus Muscle Group (pelvic muscles, middle of the hip and hamstring or muscles behind the thigh), Hip

Muscle Group (upper hip and pelvis), Abdominal Muscle Group (Tranvers abdominis, multifidus, front and side abdominal muscles, oblique or waist area muscles), Spine Muscle Group (muscles in the backbone area) and diaphragm muscles (Kibler, Press & Sciascia 2006).

Core stability exercise was originally used as an exercise for athletes to have strength in each muscle part but is increasingly being developed for training in postpartum mothers because the target muscles trained are very influential in the postpartum recovery process (Dipietro, Evenson, Bloodgood, et al. 2019), (Rahmaniar, Halik, Purnamasari et al 2019).

In this study, it was concluded that core stability exercise is effective for increasing beta-endorphin levels. Core stability exercise that has been implemented in this study is a physical exercise method consisting of a series of movements to strengthen the abdominal muscles, diaphragm muscles, pelvic muscles, L1-L5 spine and hamstrings. Not only physical exercise is given to postpartum mothers but education and explanation of the function of the movement in each session given makes the mother understand the role and function of the movement, and the addition of counseling about postpartum mothers also increases the mother's knowledge and gives enthusiasm to run well in the postpartum period.

Postpartum mothers who perform Core stability exercise will experience increased hypothalamic-pituitary-adrenal axis (HPA axis) activity within adaptive physiological limits. Activation of the HPA axis will stimulate the release of endogenous peptides, including beta-endorphins, from the anterior pituitary gland into the systemic circulation. This process occurs as a form of the body's response to mild physical stress brought about by exercise, ultimately creating a natural euphoric effect and analgesia.

In addition, the consistent muscle contractions during CSE also stimulate mechanosensory receptors and proprioceptors, which send signals to the spinal cord and brain. The impulses are relayed to the limbic system and hypothalamus, two regions that play an important role in emotion regulation and endogenous hormone secretion. As a result, there is an increase in beta-endorphin secretion, which plays a role in reducing the intensity of back pain and the level of disability in postpartum mothers (Xue, Sun, Zhu, et al. 2020).

Increased levels of beta-endorphins can also cause a sense of pleasure, relaxation, and happiness without anxiety and stimulate the immune system in postpartum mothers

CONCLUSION

Core stability exercise is more effective for increasing beta-endorphin hormone levels after controlling anxiety compared to postpartum exercises. The results of this study as a guide for midwives to apply, increase knowledge, and skills regarding core stability exercise. Health workers, especially midwives, can be promoted core stability exercise as excellent service with the best quality when

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providing midwifery care to postpartum mothers. Future research is expected to use biomarkers, namely the hormone cortisol so that the results are more accurate in measuring anxiety scores, thus minimizing subjectivity.

REFERENCES

Ahmadinezhad, G.S., Karimi, F.Z., Abdollahi, M. and NaviPour, E. (2024). Association between Postpartum Depression and Breastfeeding Self-Efficacy in Mothers: A Systematic Review and Meta-Analysis. *BMC Pregnancy and Childbirth*. 24 (273). Available at: https://doi.org/10.1186/s12884-024-06465-4

Barone, Y., Cuniberti, F. and Perna, G. (2022). *Anxiety Disorders. In: Key Topics in Perinatal Mental Health* . Springer. p. Cham

Bashirian, S., Ouji, Z., Afshari, M., Barati, M., et al. (2020). Effect of an Educational Intervention Based on the BASNEF Model on Promoting Physical Activity Among Postpartum Women. *International Quarterly of Community Health Education*. 40 (2): 151–158. Available at: https://doi.org/10.1177/0272684X19858897

Chronopoulou, E., Raperport, C., Serhal, P., Saab, W., et al. (2021) Preconception Tests at Advanced Maternal Age. *Best Practice and Research: Clinical Obstetrics and Gynaecology*. 7028–50.

Dipietro, L., Evenson, K.R., Bloodgood, B., Sprow, K., et al. (2019). Benefits of Physical Activity during Pregnancy and Postpartum: An Umbrella Review. *Medicine and Science in Sports and Exercise*. 51 (6): 1292–1302. Available at: https://doi.org/10.1249/MSS.0000000000001941

Guintivano, J., Manuck, T. and Meltzer-Brody, S. (2018). Predictors of Postpartum Depression: A Comprehensive Review of the Last Decade of Evidence *Clinical Obstetrics and Gynecology*. 61 (3): 591–603. Available at: https://doi.org/10.1097/GRF.0000000000000368

Hildebrandt, T., Shope, S., Varangis, E., Klein, D., et al. (2014). Exercise reinforcement, stress, and β-endorphins: An initial examination of exercise in anabolic-androgenic steroid dependence. *Drug and Alcohol Dependence*. 139(1): 86–92. Available at: https://doi.org/10.1016/j.drugalcdep.2014.03.008

I-NAMHS (2022) *National Adolescent Mental Health Survey*. Universitas Gadjah Mada. Yogyakarta

Karimah, N., Afriannisyah, E., Ropitasari and Fatsena, R.A. (2024). Home Core Stability Exercise Reduces The Intensity Of Pain And The Level Of Lower Back Disability In Postpartum Mothers. *African Journal OF Biomedical Research*. 27 (4s): 6099–6110. Available at: https://doi.org/10.53555/AJBR.v27i4S.4738

Karimah, N., Khafidhoh, N., Hardjanti, T. and Hakim, R. (2019). The Period of Perineal Wound Healing in Postpartum Mothers Between The Decoction Water Treatments of Bihanong Leaves with Red Betel Leaves. *GHMJ (Global Health Management Journal)*. 3 (3): 107–116. Available at: https://doi.org/10.35898/ghmj-33454

Karimah, N., Supriyana, Sumarni, S. and Sunarto. (2022). The Effectiveness of Hot Herbal Compress in Accelerate Uterine Involution and Recovery of Afterpains on the Postpartum Mothers. *ENDLESS: Journal of Futures*

Studies. 5 (1): 1–18. Available at: http://dx.doi.org/10.54783/endlessjournal.v5i1.235

Kartal, Y.A., Kaya, L., Yazici, S., Engin, B., et al. (2022). Effects of Skin-To-Skin Contact on Afterpain and Postpartum Hemorrhage: A Randomized Controlled Trial. *Nursing and Health Sciences*. 24 (2): 479–486. Available at: https://doi.org/10.1111/nhs.12945

KEMENKES. (2018). *Hasil Utama Riskesdas Tentang Prevalensi Balita Pendek di Indonesia 2018*. Kemenkes. Jakarta

Kibler, W. Ben, Press, J. and Sciascia, A. (2006). The Role of Core Stability in Athletic Function. *Sport Medicine*. 36 (3): 189–198. Available at: https://doi.org/10.2165/00007256-200636030-00001

Lestari, I., Rahmawati, I., Windarti, E. and Hariyono. (2019). Speos (Stimulation of Endorphin, Oxytocin and Suggestive): Intervention to Improvement of Breastfeeding Production. *Medico-Legal Update*. 19 (1): 210–215. Available at: https://doi.org/10.5958/0974-1283.2019.00042.2

Litwack, G. (2022). *Hormones*. Elsevier. United Kingdom

Lowdermilk, D.L., Cashion, K., Alden, K.R., Olshansky, E., et al. (2023). *Maternity and Women's Health Care*. Elsevier Health Sciences. Missouri

Mikkelsen, K., Stojanovska, L., Polenakovic, M., Bosevski, M., et al. (2017). Exercise and mental health. *Maturitas*. 106 (September): 48–56. Available at: https://doi.org/10.1016/j.maturitas.2017.09.003

Mohamed, E.A., El-Shamy, F.F. and Hamed, H. (2018). Efficacy of kinesiotape on functional disability of women with postnatal back pain: A randomized controlled trial. *Journal of Back and Musculoskeletal Rehabilitation*. 31 (1): 205–210. Available at: https://doi.org/10.3233/BMR-170827

Norris, C.M. (2023). *Back Rehabilitation: Core Stability Re-examined: Third Edition*. Taylor and Francis. United Kingdom

Pfaffe, T., White, J.C., Beyerlein, P., Kostner, K., et al. (2011). Diagnostic Potential of Saliva : Current State and Future Applications. *Clinical Chemistry*. 57 (5): 675–687. Available at: https://doi.org/10.1373/clinchem.2010.153767.

Rahmaniar, A.S.P., Halik, A.A., Purnamasari, N. (2019). Pengaruh Senam Nifas terhadap Intensitas Nyeri Perineum dan Kecemasan Ibu Postpartum di RSIA Pertiwi Makassar. *UMI medical journal*. 4 (2): 11–19. Available at: https://doi.org/10.33096/umj.v4i2.64

Robinson, H.S. and Balasundaram, A.P. (2018). Effectiveness of physical therapy interventions for pregnancy-related pelvic girdle pain (PEDro synthesis). *British Journal of Sports Medicine*. 52 (18): 1215–1216. Available at: https://doi.org/10.1136/bjsports-2017-098287.

Salamah, U. and Prasetya, P.H. (2019). Faktor - Faktor yang Mempengaruhi Ibu dalam Kegagalan Pemberian ASI Eksklusif. *Jurnal Kebidanan*. 5 (3): 199–204.

Seshadri, S., Morris, G., Serhal, P. and Sab, W. (2021). Assisted Conception in Women of Advanced Maternal Age. *Best Practice and Research: Clinical Obstetrics and Gynaecology*. 70(1): 10–20. Available at: https://doi.org/10.1016/j.bpobgyn.2020.06.012

Suri, M., Sharma, R. and Saini, N. (2017) Neuro Physiological Correlation Between Yoga, Pain and Endorphins.

Interantional Journal of Adapted Physical Education & Yoga. 2 (9): 18–32

Thabet, A.A. and Alshehri, M.A. (2019). Efficacy of Deep Core Stability Exercise Program in Postpartum Women with Diastasis Recti Abdominis : A Randomised Controlled Trial. *Journal of Musculoskeletal and Neuronal Interactions*. 19 (1): 62–68.

Wang, X., Zheng, J., Yu, Z., Bi, X., et al. (2012). A Meta Analysis of Core Stability Exercise versus General Exercise for Chronic Low Back Pain. *Plose One*. [Online] 7 (12): 1–7. Available at: https://doi.org/10.1371/journal.pone.0052082

WHO. (2023). *Bersama - sama Dukung Ibu Sukses Menyusui dan Bekerja*. WHO. Jakarta. Available at: https://www.who.int/indonesia/news/events/world-breastfeeding-week/2023#:~:text=Cakupan%20ASI%20ekslusif%20Indonesia%20pada%202022%20tercatat%20hanya,dukungan%20lebih%20intensif%20agar%20cakupan%20ini%20bisa%20meningkat. (Accessed: 10 May 2024).

Xue, L., Sun, J., Zhu, J., Ding, Y., et al. (2020) The Patterns of Exercise-Induced β-Endorphin Expression in the Central Nervous System of Rats. *Neuropeptides*. 82 (102048). Available at: doi: https://doi.org/10.1016/j.npep.2020.102048

Yadav, R.K., Magan, D., Mehta, N., Sharma, R., et al. (2012) Efficacy of a short-term yoga-based lifestyle intervention in reducing stress and inflammation: Preliminary results. *Journal of Alternative and Complementary Medicine*. 18 (7): 662–667. Available at: https://doi.org/10.1089/acm.2011.0265

Yuliarti, N. (2010) *Panduan Lengkap Olahraga bagi Wanita Hamil & Menyusui*. Penerbit ANDI. Yogyakarta

Yusuf, N.N. (2022) *Keberhasilan Persalinan dengan Augmentasi terhadap Kadar Kortisol*. Penerbit NEM. Pidie

Zheng, F., Liu, S., Yin, Q., Zheng, Y., et al. (2024) Long-Term Impact of Self-Compassion Training with Core Stability Exercise on Patients with Nonspecific Chronic Low Back Pain: A Randomized Controlled Trial. *Journal of Psychosomatic Research*. 181. (111678). Available at: https://doi.org/10.1016/j.jpsychores.2024.111678