

BENEFITS “SAJOJO” AS EFFORTS THROUGH THE PROMOTION OF HEALTH EFFECTS OF BLOOD CHOLESTEROL

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ABSTRACT

Background: The objective of this research study is to identify the benefit of the effects of aerobic training and Sajojo gymnastics performed once a week and three times a week towards the levels of HDL-cholesterol, LDL-cholesterol, total cholesterol, and the ratio of HDL/LDL blood cholesterol. **Methods:** This is an experimental research study using the randomized control group pre-test post-test design. The samples of this research were 45 participants which were divided into 3 groups namely the control group, the treatment group with the intensity of once a week, and the treatment group with the intensity of 3 times a week. The treatment was conducted in 8 weeks. Before and after the treatment, the blood sample of the participants were taken to observe the level of HDL-cholesterol, LDL-cholesterol, total cholesterol, and the ratio of HDL/LDL cholesterol using the CHOD-PAP test in Tamalanrea laboratorium Ujung Pandang (Tamalanrea Laboratory Training Center, Ujung Pandang). The data were analyzed using t-tests and ANAVA with the level of significance of 5%, continued with SLD tests with the level of significance of 5%. **Results:** the results of this research showed that Sajojo gymnastics training in three times a week increased the levels of HDL-cholesterol more than the training done once a week ($p < 0.05$). Sajojo gymnastics training in three times a week decreases the levels of LDL-cholesterol more than the training done once a week ($p < 0.05$). Sajojo gymnastics training in three times a week decreased the levels of total cholesterol more than the training done once a week ($p < 0.05$). And Sajojo gymnastics training in three times a week increased the ratio of HDL/LDL-cholesterol more than the training done once a week ($p < 0.05$). **Conclusion:** From the results of this research, it can be concluded that aerobic training of Sajojo gymnastics was effective to maintain the balance levels of HDL/LDL cholesterol. So, that are more effective to promote, rehabilitation and maintenance of health.

Key words: cholesterol, training, aerobic

ABSTRAK

Penelitian ini bertujuan untuk mengetahui perbedaan pengaruh latihan aerobik dg senam sajojo 1x/minggu dan 3x/minggu terhadap kadar HDL-Kholesterol, LDL- KOLESTEROL, kolesterol total, dan ratio HDL/LDL kolesterol darah. Penelitian ini merupakan penelitian Eksperimen, dengan rancangan randomized control group pre-test post-test design. Sampel penelitian ini sebanyak 45 orang yang selanjutnya dibagi menjadi 3 kelompok yaitu kelompok kontrol, kelompok perlakuan dengan 1x/minggu, dan kelompok dengan 3x/minggu selama 8 minggu. Sebelum dan sesudah perlakuan sampel diambil darahnya untuk mengetahui kadar HDL-Kolesterol, LDL-Kholesterol, kolesterol total dan ratio HDL/LDL kolesterol dengan menggunakan metode CHOD-PAP test di Balai Latihan Laboratorium Tamalanrea Ujung Pandang. Analisis data menggunakan t-test dan anava yang taraf signifikan 5% dan dilanjutkan dengan uji SLD dengan taraf signifikan 5%. Hasil penelitian menunjukkan bahwa latihan senam sajojo 3x/minggu lebih meningkatkan kadar HDL-Kholesterol dibandingkan dengan latihan 1x/minggu ($p < 0,05$), latihan senam sajojo 3x/minggu lebih menurunkan kadar LDL-kolesterol dibanding dengan latihan senam sajojo 1x/minggu ($p < 0,05$) latihan senam sajojo 3x/minggu lebih menurunkan kolesterol total dibandingkan dengan latihan senam sajojo 1x/minggu ($p < 0,05$). Dan latihan senam sajojo 3x/minggu lebih meningkatkan rasio HDL/LDL-Kholesterol dibandingkan dengan latihan senam sajojo 1x/minggu ($p < 0,05$). Hasil penelitian dapat disimpulkan bahwa latihan aerobik dengan senam sajojo efektif untuk menjaga keseimbangan HDL/LDL kolesterol. Sajojo juga lebih efektif untuk meningkatkan, rehabilitasi dan penjagaan kesehatan.

Kata kunci: kolesterol, latihan, aerobik

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INTRODUCTION

The cardiovascular disease is generally caused by some predisposition factors involving diets, hypercholesterolemia, hypertension, age, and sex (Strong, 1991). The previous research demonstrates that metabolism disorders are related to the atherosclerosis and are indirectly related to the coroner heart disease (Harper, 1993). Epidemiologic research studies show that there is a positive correlation between LDL-cholesterol and the coroner heart disease (Suyunu, 1991). From the above discussion, it can be inferred that the cardiovascular disease mostly can end in death. Thus, people need to do efforts in preventing the cardiovascular disease. The efforts can be in the form of doing physical activities and sports (Kent, 1994).

Regular physical training with the proper dose can improve our health, fitness, performance, and it can also be rehabilitation for body function disorders (Bompa, 1990). The physical training can also be a management modulator of the cardiovascular diseases non-pharmacologically (Jeyamalar, 1994). The physical training can recover dislipidemia which causes atherosclerosis and other cardiovascular disease.

Niebauer (1995) affirms that physical activity programs are steady state and rhythmical activities, such as jogging, swimming, and bicycling. The steady state and rhythmical physical activities have more benefits on the cardiovascular system if compared with static physical activities such as isometric contraction. The studies conducted by the alumni of Harvard in Castelli (1987) states that to decrease the risk of heart attack, people need to spend 2Kkal per week. The optimum physical activities are walking along 2 miles per day, playing tennis, and swimming 3–4 times a week (Castelli, 1987). Therefore, sports can prevent cardiovascular diseases. They can also be efforts in preventing, promoting, and rehabilitating people who suffer from the coroner heart disease (Karamer, 1995).

From many kinds of physical activities which have been developed to manage the profile of fat (HDL, LDL cholesterol and total cholesterol), there is an interesting kind of aerobic to be developed as one effort in managing the profile of body fat. It is Sajojo gymnastics which is a kind of gymnastics from Irian Jaya and it grows rapidly in Indonesia. Recently, the

Sajojo gymnastics is developed to achieve a certain goal which is improving physical fitness. Sunardi et al. (1998) modifies Sajojo gymnastics and names it Sajojo Jatim gymnastics which contains movements and steps which are expected to recover the profile of fat more.

The Sajojo gymnastics is mostly performed by young women since the movements are very attractive for women in the age. Hitherto, it is not scientifically proven that Sajojo gymnastics affects physical fitness of the performers, especially their profile of cholesterol. Thus, there should be research which can investigate the effects of aerobic training using Sajojo gymnastics towards the profile of fat, especially in women.

Based on the background to the study above, the problems are formulated as follows: (1) does Sajojo gymnastics performed once and three times a week increase the levels of HDL cholesterol in women? (2) which Sajojo gymnastics does increase the levels of HDL cholesterol in women more, the one performed once a week, or the one performed three times a week? (3) does Sajojo gymnastics performed once and three times a week decrease the levels of LDL cholesterol in women? (4) which Sajojo gymnastics does decrease the levels of cholesterol in women more, the one performed once a week, or the one performed three times a week? (5) does Sajojo gymnastics performed once a week and three times a week decrease the levels of total cholesterol in women? (6) does Sajojo gymnastics performed three times a week decrease the levels of total cholesterol in women? (7) which Sajojo gymnastics does decrease the levels of total cholesterol in women more, the one performed once a week, or the one performed three times a week? (8) does Sajojo gymnastics performed once a and three times a week increase the ratio of HDL/LDL in women? and (9) which Sajojo gymnastics does increase the ratio of HDL/LDL in women more, the one performed once a week, or the one performed three times a week?

The hypotheses in this research include: (1) Sajojo gymnastics performed once a and three times week a increases the levels of HDL cholesterol in women, (2) Sajojo gymnastics performed three times a week increases the levels of HDL cholesterol in women better than one performed once a week, (3) Sajojo gymnastics performed once and three times a week decreases the levels of LDL cholesterol in women, (4) Sajojo gymnastics performed three

times a week decreases the levels of cholesterol in women better than the one performed once a week, (5) Sajojo gymnastics performed once a week and three times a week decreases the levels of total cholesterol in women, (6) Sajojo gymnastics performed three times a week decreases the levels of total cholesterol in women better than the one performed once a week, (7) Sajojo gymnastics performed once a week increases the ratio of HDL/LDL in women, (8) Sajojo gymnastics increases the ratio of HDL/LDL in women, and (9) Sajojo gymnastics performed three times a week increases the ratio of HDL/LDL in women more than the one performed once a week.

METHOD

This is experimental laboratory research which has responsible internal validity and can explain the cause effect of the profile of fat in women. The results of this study will be able to demonstrate the effect of Sajojo gymnastics performed once a week and three times a week towards the profile of fat in women. This research used the *randomized control group pre-test pos-test design* (Arikunto, 1998).

The samples of this research involved 45 women in the age of 36–38 and physically healthy. The samples were taken randomly from the population of the 130 members of gymnastics of Faculty of Education of Sport and Health, Institute of Teacher Training and Education Science of Ujung Pandang. The samples were divided into three groups using the ordinal pairing method which could result in balanced groups. Having formed three groups, the researcher randomly chose the treatment for each group. The results of one-way anova tests on the pre-tests of each group showed that there were no significant differences in pre-tests among group 1, group 2, and group 3 on the variable of HDL-cholesterol ($p = 0.613$), there were no significant differences in pre-tests among group 1, group 2, and group 3 on the variable of LDL-cholesterol ($p = 0.8531$), there were no significant differences in pre-tests among group 1, group 2, and group 3 on the variable of total cholesterol ($p = 0.9921$), and there were no significant differences in pre-tests among group 1, group 2, and group 3 on the variable of ratio of HDL/LDL cholesterol ($p = 0.8299$). These results show that group 1, group 2, and group 3 had balanced values before treatment. After that, the treatments

were given to the groups. Group 1 was treated using the Sajojo gymnastics program for once per week in 8 weeks, 2 sets each session. Group 2 was treated using the Sajojo gymnastics program for three times per week in 8 weeks, 2 sets each session. Group 3 was as the control group (without treatment).

The *CHOP-PAP test* (Kattermann, 1984) was used to measure the levels of HDL-cholesterol, LDL-cholesterol, total cholesterol, and the ration of the levels of HDL/LDL cholesterol. The measurement of the levels of HDL-cholesterol, LDL-cholesterol, total cholesterol, and the ratio of the levels of HDL/LDL cholesterol was conducted by Tamalanrea Laboratory Training Center Ujung Pandang.

RESULT

The Test of Distribution Normality and Variance Homogeneity of Initial Data

Normality distribution test of HDL (mg/dl), LDL (mg/dl), total cholesterol (mg/dl), and the HDL/LDL ratio was all variable on control group, group one and gorup two were significant with $p > 0.05$, except TOT control group 0.0173. The Results of the Test of Variance Homogeneity variables of HDL (mg/dl), LDL (mg/dl), Total cholesterol (mg/dl), and the Ratio of HDL/LDL with lavene test were homogen with $p > 0.05$.

The Variable of the Levels of HDL Cholesterol

Results of pair T-tests the variable of the levels HDL Cholesterol (mg/dl) on control group $p: 0.110$ ($p < 0.05$) not significant, group one with $p: 0.000$ ($p < 0.05$) significant, group two $p: 0.00-$ ($p < 0.05$) significant. So, the result of anova follows: results of one-way anova tests the variable of the levels of HDL Cholesterol (mg/dl) had mean pretest control group 41.8600 ± 3.0383 and posttest 41.0800 ± 8.9555 , group one pretest 42.6467 ± 4.1838 and posttest 57.4533 ± 7.3387 , group two pretest 43.2733 ± 4.3465 and posttest 67.5800 ± 4.5686 , and the result of anova analysis was pretest 0.8531 and posttest 0.000.

The Variable of the Levels of LDL Cholesterol

The results of pair t-tests the variable of the levels of LDL Cholesterol (mg/dl) on control group with mean diferent -1.1267 and probability: 0,809 ($p > 0.05$; not significant and group one with mean diferent 26.2133 probability: 0.000 ($p < 0.05$; significant), and group two

with mean different 38.7467 and probability: 0.000 ($p < 0.05$; significant).

The results of one-way anova tests the variable of the levels of LDL Cholesterol (mg/dl) on control group pretest 142.187 ± 9.665 and posttest 143.313 ± 11.592 , group one pretest 143.820 ± 5.900 and posttest 17.307 ± 12.778 . probability LDL pretest 0,8531 and posttest 0,000 ($p < 0.05$; significant).

The Variable of the Level of Total Cholesterol

Results of pair t-tests ($n = 15$) the variable of the level of total Cholesterol (mg/dl) with mean different 2.5067 and probability 0,665 ($p < 0.05$), group one with mean different 29,67333 and probability 0.000 ($p < 0,05$; significant), group two with mean different 50,7733 and probability 0,000 ($p < 0.05$; significant).

Results of one-way anova tests the variable of the levels of total Cholesterol (mg/dl) on control group with Mean \pm SD pretest 211.447 ± 12.558 posttest 208.940 ± 11.142 , group one pretest 211.960 ± 10.741 posttest 182.287 ± 11.803 , group two pretest 211.553 ± 11.899 posttest 160.780 ± 11.949 . probability pretest 0.9921 and posttest 0,000 ($p < 0.05$; significant).

The Variable of the Ratio of HDL/LDL

Results of pair t-tests the variable of the ratio of HDL/LDL in control group with mean different 0.0067 and probability 0.715, group one: mean different 0.073 and probability 0.000, group two: mean different 0.107 and probability 0.000 ($p < 0.05$; significant). Results of one-way anova tests ($n = 15$) the variable of the ratio of HDL/LDL showed Mean \pm SD pretest 0.1967 ± 0.0272 and posttest 0.2900 ± 0.0702 , group one: pretest 0.2967 ± 0.0366 posttest 0.4940 ± 0.0734 , group two: pretest 0.3027 ± 0.0284 posttest 0.6580 ± 0.0275 . the result analysis pretest 0,8299 and posttest 0,000 ($p < 0.000$; significant).

DISCUSSION

Tests of Distribution Normality and Variance Homogeneity

Through the tests of distribution normality on the initial data (*pre-test*) which involved the variables of HDL-cholesterol, LDL cholesterol, Total cholesterol, and the ratio of HDL/LDL, it can be determined that: (1) the variables of HDL-cholesterol on the control group, group 1 and group 2 were normally distributed, (2) LDL-cholesterol on the control group,

group 1 and group 2 was normally distributed, (3) the total cholesterol on the control group, group 1 and group 2 was normally distributed, and (4) the ratio of HDL/LDL on the control group, group 1, and group 2 was normally distributed. The results of the tests of variance homogeneity of the initial data (pre-test) on the variables of HDL-cholesterol, LDL-cholesterol, Total cholesterol, and the ratio of HDL/LDL showed that (1) the variable of HDL-cholesterol on the control group, group 1, and group 2 had homogeneous variance, (2) LDL-cholesterol on the control group, group 1, and group 2 had homogeneous variance, (3) Total cholesterol on the control group, group 1, and group 2 had homogeneous variance, and (4) the ratio of HDL/LDL on the control group, group 1, and group 2 group 1 and group 2 (table 2). Thus, the data variable on blood taking and the variable of the levels of cholesterol could be analyzed using inferential statistics (Hadi, 1993).

The Comparison of Sajojo Gymnastics Performed Once a Week and One Performed Three Times a Week on the Variable of the Levels of HDL Cholesterol

The pair t-test of pretest among groups showed that HDL the treatment group 1 (G1) was significantly different ($p = 0.000$) from HDL on pre-test on G1, and HDL on treatment group 2 (G2) was significantly different ($p = 0.000$) from HDL on pre-test on G2. The results of this study also showed that Sajojo gymnastics performed once a week, 2 sets each increased HDL-cholesterol and Sajojo gymnastics performed three times a week, 2 sets each also increased HDL-cholesterol. Therefore, the hypothesis which states that Sajojo gymnastics performed once a week increases the levels of HDL-cholesterol on women is confirmed as well as confirmed 3x a week.

The results of the one-way anova tests showed that there were significant differences ($p = 0,000$) among the HDL post-test on G0, the HDL post-test on G1, and the HDL post-test on G2. The LSD (Least Significant Difference) tests showed that the HDL post-test on G0 was significantly different ($p < 0.05$) from the HDL post-test on G1, the HDL post-test on G0 was significantly different ($p < 0.05$) from the HDL post-test on G2, and the HDL post-test on G1 was significantly different ($p < 0.05$) from the HDL post-test on G2. The results showed that Sajojo gymnastics performed three

times a week increase the level of HDL-cholesterol more than one performed once a week. Thus, the hypothesis which states that Sajojo Jatim gymnastics performed three times a week increases the levels of HDL-cholesterol of women more than one performed once a week is confirmed.

The results of the research showed that Sajojo gymnastics whether performed once a week or three times a week could probably improved the activity of *lipoprotein lipase* and the activity of *lecithin cholesterol acyl transferase* (LCAT). The improvement of the activity of lipoprotein lipase causes VLDL catabolism on muscle and tissues. The increased VLDL catabolism will increase the levels of HDL cholesterol in blood (Nielson, 1980). The improvement of the activity of lecithin cholesterol acyl transferase causes the increase of esterification processes on HDL so that HDL cholesterol in blood increases (Simko, 1979). In addition, both program may prohibit the activity of hepatic trigliserida hidrolase enzyme in the liver so that the process of catabolism HDL in blood decreases and eventually will increase the levels of HDL cholesterol.

The Comparison of the Effects of Sajojo Gymnastics Performed once a Week and One Performed Three Times a Week Towards the Variable of the Level of LDL Cholesterol

The results of pair t-tests showed that the LDL pre-test on the first treatment group (G1) was significantly different ($p = 0.000$) from the LDL pre-test on G1, and the LDL pre-test on the second treatment group (G2) was significantly different ($p = 0.000$) from the LDL pre-test on G2. It can be inferred that Sajojo gymnastics performed once a week decreases LDL-cholesterol and Sajojo gymnastics performed three times a week also decreases LDL-cholesterol. Therefore, the hypothesis which states that Sajojo gymnastics performed once a week decreases the levels of LDL-cholesterol in women is confirmed. Further, the hypothesis which states that Sajojo gymnastics performed three times a week decreases the levels of LDL-cholesterol on women is confirmed.

The one-way anova test showed that there were significant differences ($p = 0.000$) among the LDL post-test on G0, the LDL post-test on G1, and the HDL post-test on G2 (table 6). The LSD (*Least Significant Difference*) test showed that the LDL post-test on G0 was significantly different ($p < 0.05$) from the LDL post-

test on G1, the LDL post-test on G0 was significantly different ($p < 0.05$) from the LDL post-test on G2, and the LDL post-test on G1 was significantly different ($p < 0.05$) from the LDL post-test on G2. From the results, it can be inferred that Sajojo gymnastics performed three times a week decreased the levels of LDL-cholesterol more than one performed once a week. Hence, the hypothesis which states that Sajojo Jatim gymnastics performed three times a week decreases the levels of LDL-cholesterol on women more than one performed once a week is confirmed.

The results of the study above are similar to Lehmann's (1997) who states that the exercise decreases the levels of LDL cholesterol significantly. Lehmann uses the training program in the form of long distance run in 4 weeks covering 174,6 per week.

From the discussion above, it can be concluded that Sajojo gymnastics training, whether it was performed once a week or three times a week might be able to decrease the activity of *hepatic lipase*. The decrease of the activity of hepatic lipase causes the decrease of hydrolysis of VLDL into HDL so that HDL cholesterol is decreasing (Peltonen, 1981).

The Comparison of the Effects of Sajojo Gymnastics Training Performed once a Week and once Performed Three Times a week Towards the Variable of the Levels of Total Cholesterol

The pair T-Tests showed the TOT pre-test on the first treatment group (G1) was significantly different ($p = 0.000$) from the TOT pre-test on G1, and the TOT pre-test on the second treatment group (G2) was significantly different ($p = 0.000$) from the TOT pre-test on G2. This result showed that Sajojo gymnastics performed once a week decreased total cholesterol and one performed three times a week also decreased total cholesterol. Thus, the hypothesis which states that Sajojo gymnastics performed once a week decreases Total cholesterol on women is confirmed. Furthermore, the hypothesis which states that Sajojo gymnastics performed three times a week decreases Total cholesterol on women is confirmed.

The one-way anova tests showed that there were significant differences ($p = 0,000$) among the TOT post-test on G0, the TOT post-test on G1, and the TOT post-test on G2 (table 8). The LSD (*Least Significant Difference*) tests showed that the TOT post-test on

G0 was significantly different ($p < 0.05$) from the TOT post-test on G1, the TOT post-test on G0 was significantly different ($p < 0.05$) from the TOT post-test on G2, and the TOT post-test on G1 was significantly different ($p < 0.05$) from the TOT post-test on G2. From the results, it can be inferred that Sajojo gymnastics performed three times a week decreases the level of Total cholesterol more than one performed once a week. Thus, the hypothesis which states that Sajojo gymnastics performed three times a week decrease the levels of Total cholesterol on women more than one performed once a week in confirmed.

From the results above, it can be inferred that Sajojo gymnastics training, whether performed once a week or three times a week might be able to reduce the activity of *hepatic lipase* and the increase of the activity of *hepatic lipase* causes the decrease of hydrolysis of VLDL into HDL so that HDL cholesterol is decreasing (Peltonen, 1981). The increase of the activity of *lipoprotein lipase* causes the increase of catabolism of VLDL so that the HDL of blood cholesterol increases. This causes the distribution of cholesterol from liver increases so that the total cholesterol decreases (Nielson, 1980).

The Comparison of the Effect of Sajojo Gymnastics Performed Once A Week and Three Times a Week Towards the Variable of Ratio of HDL/LDL

The pair T-tests show that the HLRAT pre-test on the first treatment group (G1) was significantly different ($p = 0.000$) from the HLRAT pre-test on G1, and the HLRAT pre-test on the second treatment group (G2) was significantly different ($p = 0.000$) from the HLRAT pre-test on G2. The results above show that Sajojo gymnastics training performed once a week increase the ratio of HDL/LDL and Sajojo gymnastics training performed three times a week also increase the ratio of HDL/LDL. Thus, the hypothesis which states that Sajojo gymnastics training performed once a week increases the ration of HDL/LDL on women is confirmed. Furthermore, the hypothesis which states that Sajojo gymnastics training performed three times a week increases the ratio of HDL/LDL on women is also confirmed.

The one-way anova test showed that there were significant differences ($p = 0,000$) among the HLRAT post-test on G0, the HLRAT post-test on G1, and the HLRAT post-test on G2 (table 4). The LSD (*Least*

Significant Difference) test confirms that the HLRAT post-test on G0 was significantly different ($p < 0,05$) from the HLRAT post-test on G1, the HLRAT post-test on G0 was significantly different ($p < 0,05$) from the HLRAT post-test on G2, and the HLRAT post-test on G1 was significantly different ($p < 0,05$) from the HLRAT post-test on G2. The results of this study demonstrate that Sajojo gymnastics training performed three times a week increase the ratio of HDL/LDL more than the one performed once a week. Thus, the hipotesis which states that Sajojo gymnastics training performed three times a week increases the ratio of HDL/LDL on women more than the one performed once a week is confirmed. Michelle and Naama (2000) suggested that some some hormonal responses to exercise are dependent on exceeding a certain threshold intensity, volume and muscle mass activation.

CONCLUSION AND SUGGESTIONS

Conclusion

From the results of this study, it can be concluded that: Sajojo gymnastics performed once a week increases the levels of HDL-cholesterol on women, and three times a week increases the levels of HDL-cholesterol on women. Sajojo gymnastics performed three times a week increases the levels of HDL-cholesterol on women better than one performed once a week. Sajojo gymnastics performed once a week decreases the levels of LDL-cholesterol on women, and three times a week decreases the levels of LDL-cholesterol on women. Sajojo gymnastics performed three times in a week decreases the levels of LDL-cholesterol on women better than one performed once a week. Sajojo gymnastics performed once a week and three times a week decreases the levels of total cholesterol on women. Sajojo gymnastics performed once a week decreases the levels of total cholesterol on women better than one performed once a week. Sajojo gymnastics performed once a week and three times a week increases the ratio of HDL/LDL on women. Sajojo gymnastics performed three times a week increases the ratio of HDL/LDL on women more than one performed in once a week.

Suggestions

Based on the observation in the implementation and the results of this study, the researcher suggests the following points: (1) the next research studies

should use samples which has similar physical fitness since in the present study, the physical fitness was ignored, (2) in this research, the samples did not stay in dormitories to control their diets, activities, and their daily chores.

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