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Comparison of physical fitness and quality of life between adolescents engaged in sports and those who are not

Comparação da aptidão física e qualidade de vida entre adolescentes praticantes e não praticantes de esporte

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Abstract – Adolescence is conducive to implementing interventions that encourage healthy lifestyles, especially when there is involvement with sports. The aim of this study was to compare physical activity, physical fitness and quality of life perception of adolescents who practice and do not practice after-school sports. The sample consisted of 374 adolescents, 198 boys and 176 girls, with mean age of 16.35 ± 0.65 and 16.19 ± 0.67 years. The QAFA questionnaire was used to evaluate the level of physical activity and the Fitnessgram was used to evaluate physical fitness. The KIDSCREEN-52 was used to evaluate quality of life perception. One-way ANOVA was conducted for comparisons (p>0.05). Boys and girls who did not practice sports presented lower levels of physical activity and physical fitness compared to those engaged in after-school sports and other type of regular physical exercise (p<0,01). Boys and girls engaged in after-school sports also presented higher scores for quality of life perception (p ≤ 0.01). Adolescents engaged in after- school sports showed higher levels of physical activity and better quality of life perception. Physical fitness components were better for adolescents engaged in after-school sports and for those engaged in other physical exercise modalities.

Key words: Adolescent behavior; Exercise; Quality of life; Physical fitness.

Resumo – *A adolescência é favorável para implementar intervenções que incentivem estilos de vida saudável, especialmente se for relacionada ao esporte. Objetivou-se comparar o nível de atividade física, aptidão física e a percepção de qualidade de vida dos adolescentes que praticam e não praticam esporte no contraturno escolar. A amostra foi composta por 374 adolescentes, 198 meninos e 176 meninas, com média de idade de 16,35 ± 0,65 e 16,19 ± 0,67 anos. O questionário QAFA foi utilizado para avaliar o nível de atividade física e o Fitnessgram para a aptidão física. O KIDSCREEN-52 foi utilizado para avaliar a percepção da qualidade de vida. A Anova one-way foi realizado para as comparações (p> 0,05). Adolescentes do sexo masculino e feminino não praticantes apresentaram menores níveis de atividade física e aptidão física quando comparados aos praticantes de programas esportivos e outros tipos de exercícios físicos regulares (p <0,01). Meninos e meninas praticantes de esportes no contraturno apresentaram maiores escores para percepção de qualidade de vida (p ≤ 0,01). Os praticantes de esporte no contraturno possuem maiores níveis de atividade física e melhor percepção de qualidade de vida. Quanto à aptidão física, os componentes foram melhores para os praticantes de esporte e outras para praticantes de outra modalidade de exercício físico.*

Palavras-chave: *Aptidão Física; Comportamento dos adolescentes; Exercício; Qualidade de vida.*

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INTRODUCTION

Sport is one of the most popular physical activities and its practice in the first decades of life may be associated with better health-related behavior, such as predisposition of lifelong practice[1,2].

Taking into account that the main forms of physical activity in adolescence are active commuting, physical education classes and after-school sports practice[2,3], school seems to be a very important place for active behavior[4].

The practice of physical activities is related to improvement of health-related physical fitness (AFRS), which includes components associated with health promotion or disease prevention, better performance in daily activities, including cardiorespiratory fitness, strength and muscular resistance, flexibility and body composition. High levels of physical fitness are associated with benefits, especially for adolescents, such as positive association with academic performance[5-7].

In addition, better quality of life (QoL) perception is associated to the performance of physical activities and sports. The association between physical activity and quality of life is positive. QoL is defined as the individual's perception of his socio-cultural position in life, his goals, expectations, standards and concerns, physical, social and emotional well-being[8,9].

In view of the above, it is important to highlight the relevance of the school environment's suitability for stimulating the increase in the level of physical activity, physical fitness and quality of life perception among adolescents, which is beneficial for health as a whole. School is the place that most practice of physical exercise takes place at this stage of life, because it is where the adolescent spends a great deal of his time[10].

Several studies have analyzed the relationship between practice of physical activity, physical fitness, QoL perception and its influence on the life of the adolescent individual[11-13]. However, comparative studies between adolescents engaged and those not engaged in after-school sports activities verifying how much sport can contribute to variables physical activity, physical fitness and quality of life, are still scarce.

The aim of this study was to compare the level of physical activity, physical fitness and quality of life perception of adolescents of both sexes engaged or not in after-school physical activity in the city of Curitiba-PR.

METHODOLOGICAL PROCEDURES

This is a cross - sectional descriptive research, with *ex post facto* design. The study followed the guidelines of the National Health Council (resolution no. 466/2012), and was approved by the Ethics Research Committee of the Federal University of Paraná under CAAE registration 66930117.8.0000.0102.

The study population was composed of high-school adolescents from private schools of Curitiba that offer after-school activities with sports

focus. The sample was calculated a posteriori for 3 groups, considering effect size of 0.3 that has mean effect, standard error was 0.05 and total of 374 subjects, obtaining sampling power of 0.99.

The sample was intentional and was composed of high-school female and male adolescents from private schools of Curitiba that offer after-school activities with sports focus. The sample was divided into three groups: practice of sports (PE - participants of sports training offered by the school), practitioners of other types of physical exercise (PMEF - practitioners of another systematic physical activity, outside or inside the school, but not sports) and those not engaged in any regular physical activity (NPAF - non-practitioners of systematized physical activity). To be classified as PE or PMEF, the adolescent would have to practice the exercise at least twice a week, otherwise he was considered NPAF.

The study had as inclusion criterion students enrolled in participating schools, to be at least 15 years and under 18 years of age, accepting to participate in the study (through the signing of the Informed Consent Form - TCLE by parents or guardians, and signing the Assent Term - by adolescents). Exclusion criteria were adolescents with physical or mental disabilities and those who did not complete measurements.

A pilot study was conducted and then the research was performed at schools that agreed to participate in the research. The study was conducted during Physical Education classes, and questionnaires were filled with the follow-up of the collection team and then physical tests were carried out on the sports court provided by schools.

The independent variable, practicing or not after-school sports, was obtained by an anamnesis questionnaire, where the adolescent was questioned about practicing after-school sports or practicing another physical exercise modality in or outside the school.

Dependent variables were level of physical activity, physical fitness and quality of life perception. The level of physical activity was obtained through the Physical Activity Questionnaire for Adolescents[14], with the possibility of completing 22 physical activities, and two more may be added. In Brazilian adolescents, this questionnaire presented good reproducibility (CCI = 0.88, 95% CI = 0.84-0.91) and concurrent validity when compared to a 24-hour recall ($r = 0.62$, $p < 0.001$)[14].

The physical fitness of adolescents was obtained through the Fitnessgram protocol, Physical Fitness Education Program for health, designed for children and adolescents aged 6-18 years. The following tests were performed: The PACER test was used for VO_2max estimation; body mass index (BMI): Weight (kg)/Height (m^2); abdominal test to evaluate abdomen strength; extension test to assess trunk strength and flexibility, the flexibility of the upper limbs was measured by the arm extension test (flexion); sit-and-reach test evaluated the flexibility of posterior thigh muscles. All tests were well detailed in the Fitnessgram[15] test administration manual.

To evaluate the quality of life perception of adolescents, the KIDSCREEN-52 questionnaire validated in Brazil[9] was used. In this ques-

tionnaire, Cronbach's α presents coefficients between 0.725 and 0.894. The internal consistency values in the child/adolescent version ranged from 0.725 in the "Self-Perception" dimension to 0.894 in the "Financial Aspect" dimension, with mean global value of 0.817[9].

To obtain information on sex and age, adolescents answered a questionnaire in the classroom, applied by the study researchers. Social support was evaluated by the instrument proposed by Farias Junior et al.[16]. Socioeconomic level was evaluated by the Brazilian Economic Classification Criteria Questionnaire, proposed by the Brazilian Association of Research Companies[17]. For this study, individuals classified as A1 and A2 were in the upper class, those classified as B1 and B2 in the middle class with those classified as C1 to E in the low socioeconomic class.

Data analysis was performed by the SPSS 20.0 statistical software, with significance level set at $p < 0.05$. Absolute and relative frequency distribution and chi-square test were used for the sample characterization, and in the comparative analysis, comparison was performed through one-way ANOVA with Schefe *post hoc*.

RESULTS

The present study had final sample composed of 374 adolescents, 198 boys and 176 girls, with mean age of 16.35 ± 0.65 and 16.19 ± 0.67, respectively. The majority of boys (54.5%) were classified as engaged in sports (PE) and the minority of girls (17.6%) had this classification. About 18.2% of boys and 26.7% of girls were classified as practitioners of other types of physical exercise (PMEF). Most girls studied were classified as NPAF, with 55.7% (table 1).

As can be observed in Table 1, there was no significant difference between sexes and between groups (PE, PMEF and NPAF) in the proportion of age and also in socioeconomic level tertiles. Social support had low tertile classification (37.4%), as well as the majority of adolescents in the NPAF group (55.9%). In this group of adolescents not engaged in physical activities, when the proportions of boys and girls are compared, significant difference was observed ($p = 0.023$), where more girls have low social support compared to boys. On the high social support tertile, the sport group had higher frequency of boys and girls (50.9% and 51.6%, respectively). Although there was no significant difference between sexes, social support showed significant difference between groups (<0.001).

Regarding NAF, the majority of the sample was classified with average level of physical activity (50.3%). When groups were investigated in isolation, the high physical activity tertile was more present in PE group (53.2%), followed by the PMEF group (37.3%).

In the QoL perception, the NPAF group showed significant difference between sexes ($p = 0.022$), where more girls had lower QoL perception compared to boys. In the PE group, the highest frequency of adolescents was in the high QoL perception tertile (51.9% and 45.2%, boys and girls, respectively, $p < 0.001$).

Table 2 shows the comparison between PE, PMEF and NPAF, of variables NAF, Physical Fitness and QoL Perception for males. NAF and NPAF obtained significantly lower results (p≤0.01) compared to PE and PMEF. In physical fitness, variables that were significantly different (p≤0.01) were VO_2max of NPAF compared to PE, which were higher and showed no statistical difference between PE and PMEF, and the number abdominal exercises in NPAF was lower compared to PMEF, but no difference compared to PE was observed. QoL perception also presented significant differences (p≤0.01) in the PMEF and NPAF scores, both compared to the PE, which obtained higher scores (Table 2).

Table 3 shows the comparison between PE, PMEF and NPAF, of variables NAF, Physical Fitness and QoL Perception for girls. When NAF was compared between groups, significant difference was observed (p≤0.01), the results were smaller for NPAF than for PE and PMEF, and also when PMEF and PE were compared, values were higher for those engaged in sports. The physical fitness variables that presented difference between groups were VO_2max, abdominal and upper limb strength.

Table 1. Descriptive presentation of the sample of adolescents practicing sports, practicing other types of physical exercise and those not practicing formal physical education in private schools of Curitiba-PR (absolute and relative frequency, n = 374)

	Sports practitioners					Practitioners of another systematic physical activity					Non-practitioners of systematized physical activity				
	Male		Female			Male		Female			Male		Female		
	n	%	n	%	p	n	%	n	%	p	n	%	n	%	p
Sex					<0.001					<0.001					<0.001
Male	108	54.5	-	-		36	18.2	-	-		54	27.3	-	-	
Female	-	-	31	17.6		-	-	47	26.7		-	-	98	55.7	
Age					0.380					0.073					0.262
≤15	34	31.5	11	35.5		9	25.0	18	38.3		16	29.6	46	46.9	
≥16 à <17	59	54.6	18	58.1		17	47.2	23	48.9		32	59.3	37	37.8	
≥17 à <18	15	13.9	2	6.5		10	27.8	6	12.8		6	11.1	15	15.3	
SEL (tertile)					0.178					0.966					0.867
High	91	84.3	29	93.5		30	83.3	39	83.3		43	79.6	75	76.5	
Medium	16	14.8	2	6.5		6	16.7	8	17.0		10	18.5	23	23.5	
Low	1	0.9	0	0.0		0	0.0	0	0.0		1	1.9	0	0.0	
Social Support (tertile)					0.961					0.139					0.023
High	55	50.9	16	51.6		15	41.7	14	29.8		12	22.2	9	9.2	
Medium	32	29.6	9	29.0		12	33.3	14	29.8		17	31.5	29	29.6	
Low	21	19.4	6	19.4		9	25.0	19	40.4		25	46.3	60	61.2	
PAL (tercil)					0.866					0.063					0.122
High	57	52.8	17	54.8		16	44.4	15	31.9		10	18.5	9	9.2	
Medium	33	30.9	9	29.0		16	44.4	18	38.3		17	31.5	31	31.6	
Low	18	16.7	5	16.1		4	11.1	14	29.8		27	50.0	58	59.2	
QoL Perception (tertile)					0.164					0.666					0.022
High	56	51.9	14	45.2		6	16.7	12	25.5		15	27.8	20	20.4	
Medium	34	31.5	7	22.6		16	44.4	16	34.0		24	44.4	28	28.6	
Low	18	16.7	10	32.3		14	38.9	19	40.4		15	27.8	50	51.0	

Note. **p = comparison of proportions between sex (Male and Female); p** = comparison of proportions between groups (PE/PMEF/NPAF); SP = sports practitioners, NPEF = non-e xercise practitioners; n = Absolute frequency; % = Relative frequency; PAL = Physical Activity level; SEL = Socioeconomic Level; QoL = Quality of Life. Chi-square for proportional comparisons

Table 2. Comparison students engaged in sports, practitioners of other types of physical exercise and non-practitioners of formal physical activity, NAF, physical fitness and QoL perception for males (n = 198)

	PE	PMEF	NPAF	
	(n= 108)	(n= 36)	(n= 54)	
	Mean ± SD	Mean ± SD	Mean ± SD	F
NAF (min/week)	1074.17 ±733.98	866.89 ±572.45	471.72 ±570.07$^{\beta,¥}$	14.76*
Physical fitness				
IMC (kg/m^2)	17.07 ± 10.20	19.72 ± 10.91	17.62 ± 9.89	0.90
VO_2max (ml/kg/min)	40.15 ± 6.5	38.49 ± 5.95	36.41 ± 4.7$^{\beta}$	6.99*
Abdominal (repetitions)	41.50 ± 20.13	47.64 ± 23.46	34.09 ± 18.70$^{¥}$	4.99*
Strength and flex./trunk (inches)	12.13 ± 2.4	11.54 ± 3.02	12.50 ± 2.71	1.41
Upper force (flexion / repetitions)	23.81 ± 11.43	24.57 ± 10.89	19.79 ± 11.01	2.77
Right Flexibility (inches)	10.50 ± 3.5	9.88 ± 3.6	10.04 ± 3.5	0.55
Left Flexibility (inches)	9.84 ± 20.13	8.69 ± 3.99	9.30 ±3.27	1.60
QoL perception	77.51 ± 8.45	72.74 ± 9.15$^{\beta}$	74.18 ± 6.95$^{\beta}$	5.88*

Note. * p ≤ 0.01; β Different from those who practice sports; ¥ Different from those who practice other modalities; One-way ANOVA; Scheffe post hoc; F = degrees of freedom; PE = sports practitioners, PMEF = practitioners of another type of physical exercise; NPAF = non-practitioners of formal physical activity; AIQ = Interquartile Range; AF = Physical Activity; NAF = Level of Physical Activity; BMI = Body Mass Index; VO_2max = Maximum Oxygen Uptake; QoV = Quality of Life.

Table 3. Comparison between sports practitioners, practitioners of other types of physical exercise and non-practitioners of formal PA, NAF, physical fitness and QoL perception for females (n = 176)

	PE	PMEF	NPAF	
	(n=31)	(n=47)	(n=98)	
	Mean ± SD	Mean ± SD	Mean ± SD	F
NAF (min/week)	985.00 ± 634.95	635.43 ± 467.78$^{\beta}$	332.09 ± 359.22$^{\beta,¥}$	26.89**
Physical fitness				
IMC (kg/m^2)	18.89 ± 9.16	20.69 ± 6.2	21.84 ± 4.3	2.98
VO_2max (ml/kg/min)	33.46 ± 4.7	32.96 ± 4.5	31.16 ± 3.23$^{\beta,¥}$	5.86**
Abdominal (repetitions)	30.97 ± 16.23	33.55 ± 18.09	23.26 ± 13.97$^{\beta,¥}$	7.96*
Strength and flex./trunk (inches)	13.11 ± 2.16	14.31 ± 1.82	13.27 ± 2.70$^{¥}$	3.48*
Upper force (flexion / repetitions)	7.81 ± 6.8	7.32 ± 7.3	4.11 ± 5.3$^{\beta,¥}$	6.47**
Right Flexibility (inches)	10.98 ± 2.92	11.93 ± 3.19	10.66 ± 3.04	2.75
Left Flexibility (inches)	10.47 ± 2.69	11.64 ± 3.12	10.40 ± 3.05	2.81
QoL perception	74.84 ± 8.90	72.18 ± 10.31	69.98 ±9.35$^{\beta}$	3.25*

Note. * p ≤ 0.01; β Different from those who practice sports; ¥ Different from those who practice other modalities; One-way ANOVA; Scheffe post hoc; F = degrees of freedom; PE = sports practitioners, PMEF = practitioners of another type of physical exercise; NPAF = non-practitioners of formal physical activity; AIQ = Interquartile Range; AF = Physical Activity; NAF = Level of Physical Activity; BMI = Body Mass Index; VO_2max = Maximum Oxygen Uptake; QoV = Quality of Life.

VO_2max was different (p≤0.01) between NPAF and PE and PMEF and with no difference between the latter two groups. Abdominal strength of NPAF showed difference (p ≤ 0.05) when PE and PMEF were compared and no difference was observed between those who practice sports and those who practice other types of exercise. In the same way, there was also difference (p ≤ 0.01) in the upper limb strength of NPAF compared to PE and PMEF. Trunk strength and flexibility were higher (p≤0.05) for PMEF when compared to NPAF, with no difference compared to PE. QoL perception differed significantly (p≤0.01) in the NPEF scores, both

compared to PE that had better scores and the PE group, and PMEF showed no significant difference.

DISCUSSION

The practice of physical activity among girls is less frequent and intense than among boys, especially from adolescence[18]. Perhaps due to cultural issue, boys are encouraged since early age to perform active plays, while girls are encouraged to play less physically active games. In a recent prevalence study[19], 70.7% of Brazilian female adolescents were classified as physically inactive, compared to 38.0% of male adolescents.

These data are in line with the present study, which presented different frequencies between boys and girls in relation to PE, PMEF and NPAF, and more than half of the female sample (55.7%) were classified as NPAF, while 27.3 % of boys obtained this classification, and the opposite occurs with the proportion of adolescents in the PE group, where 54.5% of boys were classified in this group, while females were only 17.6% of the sample. Therefore, it is important to investigate and understand why males are more active than girls.

In this study, the NAF of EP was considered higher in both sexes and thus, when the total sample was observed, 53.2% of adolescents (PE) had high NAF, which was significantly higher than the NAF classification as high of PMEF and NPAF groups. A longitudinal study[20] corroborates these findings, where individuals who practice sport have higher NAF than non-athletes and physical fitness was greater in those who participate in sports activities.

The literature presents some variables associated with low levels of physical activity, such as the socioeconomic level. Belonging to lower economy classes indicates low levels of physical activity[21,22]. However, there are also studies in literature that affirm that socioeconomic level does not influence the level of physical activity[23,24]. In the present study, there was no significant difference in the proportions of the socioeconomic level between groups, since the sample belongs exclusively to economic classes A and B. However, since it is an important variable and may or may not influence the behavior of the individual, further studies are required, mainly of prevalence, using variable socioeconomic level as moderator.

Regarding the social support received from parents/friends for the practice of PA, PE adolescents were those that presented the highest frequency in variable "high social support" (51.1%). This support has been shown to be able to increase NAF, specifically sports, in adolescents and young adults[25-27]. In the present study, and according to literature, having high social support was more frequent in adolescents who practice sports or other PE modalities, when compared to those who do not perform any physical activity[25-27].

Quality of life perception has been presented with high levels in studies with physically active adolescents[28-29]. Practicing physical activity regu-

larly, reducing sedentary time, tend to lead adolescents to perceive better their QoL and health, as shown in previous studies, which may partially explain the higher proportion of students, of the current research, with high QoL perception in PE and PMEF groups when compared to the NPAF group[28,29]. In addition, the PE group presents higher proportion of adolescents classified with high QoL perception (50.4%).

When physical fitness variables are investigated separated by sex, it was possible to observe that, for males, VO_2max did not present significant differences between PE and PMEF, PMEF and NPAF, but when PE and NPAF groups were compared, significant differences between groups were observed. The conclusion regarding improvements in VO_2max in physical exercise practitioners when compared to non-PE practitioners is clear. In turn, the present study did not present significant differences between PMEF and NPAF groups specifically for males. The authors believe that the type of physical activities performed by the PMEF group may partially explain these results (low insertion of aerobic activities in training sessions). Since the frequency and duration of activities were the same for both active groups (PE and PMEF), and when girls were analyzed, this variable was better for females engaged in sports and other exercise modalities, compared to non-practitioners, as expected in literature. Therefore, regarding this physical fitness component (VO_2max), the importance of sports practice for adolescents of both sexes is highlighted, since the cardiorespiratory capacity, evaluated by VO_2max was significantly better for those engaged in sports than for those not engaged in formal physical activity.

Regarding the other physical fitness variables, abdominal strength of boys was greater for athletes of another sports modality and, when compared with the NPAF group, presented significant difference, which was not observed for PE group when compared to NPAF. The strength and flexibility scores of girls in the PMEF group presented significant difference when compared to non-PE practitioners, but the PE group showed no differences. Again, the authors believe that the type of physical activity performed during training sessions may partially explain these results. Therefore, the authors encourage future studies, with analyses of after-school activities performed by adolescents, investigating all training variables (type, frequency, duration, intensity) for a better understanding of results. Finally, it is important to report that the study did not present significant differences in the other physical fitness variables when PE and PMEF groups are compared.

Male and female adolescents in the present sport study had better QoL perception, which is in line with literature, in which sports can influence the well-being of adolescents[30]. Nevertheless, the presented scores do not show large differences between them, suggesting the performance of further studies, mainly of prevalence, investigating and analyzing quality of life perception among adolescents who practice sport or other physical exercises and also those who do not perform any formal physical activity.

The study presented some limitations, among them the fact that the re-

search included only private schools of the city of Curitiba and the collection of variables NAF, QoL perception and socioeconomic level were obtained through questionnaires, which, although the instruments presented good reproducibility, concurrent validity, and internal validity may overestimate or underestimate values; so in an attempt to minimize these biases, researchers were trained to help students respond to questionnaires in the best way possible.

Further studies are suggested to more deeply analyze the volume, intensity and frequency the practice of sports and also the practice of other sport modalities. In addition, it is necessary to analyze after-school activities performed by adolescents, investigating what they are and how they are offered.

CONCLUSION

Male adolescents who perform after-school physical activities presented better results in NAF, VO_2max, and overall QoL perception score when compared to those who do not perform any physical activity. Boys practicing other types of physical exercise had higher results in the abdominal strength component when compared with the other adolescents.

As for girls, those who perform after-school physical activities presented better results in NAF and QoL perception compared with those that do not practice sport. As for physical fitness, female adolescents engaged in sports and in other types of physical exercise, presented values similar to each other, but significantly higher than those who are not engaged in any physical activity. VO_2max, abdominal strength, trunk strength and flexibility, and upper strength were statistically higher for both those who practice sport and those who practice other types of sport modality, compared to those not engaged in any physical activity.

In view of the results, it is possible to affirm that adolescents practicing after-school sports have higher levels of physical activity and cardiorespiratory fitness. Regarding the other physical fitness components, some were better for sports practitioners and others for practitioners of other types of physical exercise. The relevance of physical exercise during adolescence, especially sports practice is evident, and for this to be possible and effective, after-school sports must be offered and be of quality for both boys and girls.

COMPLIANCE WITH ETHICAL STANDARDS

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Ethical approval

Ethical approval was obtained from the local Human Research Ethics

Committee – Federal University of Paraná and the protocol was written in accordance with the standards set by the Declaration of Helsinki.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conceived and designed the experiments: ABP, WC. Performed the experiments: ABP. Analyzed the data: EMC, TSP. Contributed reagents/materials/analysis tools: GV, VO, WC. Wrote the paper: ABP, EMC, TSP, WC.

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