Relationship between Young Esports Players' Chronotypes and Physical Activity Status

Egemen MANCI[1]* Fırat ÖZDALYAN

[1]İzmir Demokrasi University, Faculty of Health Sciences, İzmir/Türkiye

[2]İzmir Dokuz Eylül University, Necat Hepkon Faculty of Sport Science, İzmir/Türkiye

Abstract

Esports interest, participation, and the number of scientific studies is increasing day by day, but the literature on esports players and chronotypes is quite limited. In this study, it was aimed to determine the chronotypes of young adults interested in esports and to examine the relationship between them and their physical activity status. The participants in this study group included 190 participants aged 17 to 24 who are interested in esports and live in different regions of Turkey. A web-based survey was used to obtain data from esports players who participated in esports education. With this survey, the demographic information, playing time, physical activity status, and the Morningness–eveningness Questionnaire (MEQ) scale were applied to determine the chronotypes of the participants. Then, the distribution of the collected data was determined and analyzed with the SPSS 25 program. The results of the study revealed that young adult participants interested in esports were primarily "neither type (62%)" and then "evening type (31%)". In addition, according to the IPAQ results, the physical activity levels of "evening type" were significantly lowest (p<0.05). As a result, it was revealed that the chronotypes of most young adults interested in esports are "neither type". In addition, the results show that participants in neither type can spend more time on physical.

Keywords: Esports, Chronotype, Physical activity, Circadian rhythm, MEQ

Corresponding Author:
Egemen MANCI
egemenmanci@gmail.com

Genç Espor Oyuncularının Kronotipleri ve Fiziksel Aktivite Durumları Arasındaki İlişki

Öz

Espor branşına ilgi, katılım ve bilimsel çalışmaların sayısı gün geçtikçe artmasına rağmen, espor oyuncuları ve kronotipleri üzerine literatür oldukça kısıtlıdır. Bu çalışmada, esporla ilgilenen genç yetişkinlerin kronotiplerinin belirlenmesi ve fiziksel aktivite durumları ile aralarındaki ilişkinin incelenmesi amaçlanmıştır. Bu çalışma grubunda espora ilgi duyan ve Türkiye'nin farklı bölgelerinde yaşayan 17-24 yaş arası 190 katılımcı yer almaktadır. Espor eğitimine katılan esporculardan veri elde etmek için web tabanlı bir anket kullanılmıştır. Bu anket ile katılımcıların demografik bilgileri, oyun oynama süreleri, fiziksel aktivite durumları ve kronotiplerini belirlemek için Sabahçıl-Akşamcıl Anketi (MEQ) ölçeği uygulanmıştır. Daha sonra toplanan verilerin nasıl dağılım gösterdikleri kontrol edilerek SPSS 25 programı ile analizleri gerçekleştirilmiştir. Çalışmanın sonuçları, esporla ilgilenen genç yetişkin katılımcıların öncelikle "ara tip (%62)", daha sonra "akşamcıl tip (%31)" olduğunu ortaya koydu. Ayrıca, IPAQ sonuçlarına göre, "akşamcıl tipin" fiziksel aktivite seviyeleri anlamlı derecede düşüktü (p<0,05). Sonuç olarak, esporla ilgilenen genç yetişkinlerin çoğunluğunun kronotiplerinin "ara tip" olduğu ortaya çıkmıştır. Ayrıca sonuçlar, ara tipteki katılımcıların fiziksel aktiviteye daha fazla zaman ayırabildiğini göstermektedir.

Anahtar kelimeler: Espor, Kronotip, Fiziksel aktivite, Sirkadiyen Ritim, MEQ.

Introduction

It is striking that although the number of esports participants is increasing rapidly, the number of research on the subject is also increasing rapidly, but not at a level that meets the need (Ahn et al., 2020; Elliott et al., 2022; Grand View Research, 2022; Newzoo, 2023). The best example of this: is the League of Legends (LoL) is one of the most popular games, with over 100 million monthly active gamers. In addition to its increasing popularity, it is also becoming increasingly popular as a sport with very high budgets and competitions planned at the Olympic level (Tjønndal and Skauge, 2021). Esports is a branch that has a high cognitive workload (Sousa et al., 2020) and makes some cognitive abilities even stronger than traditional athletes (Kang et al., 2020). However, the sedentary nature of the sport, long playing times, sleep restrictions, or the change in circadian rhythm associated with international online activities have the potential to interfere with the protection and maintenance of general health (Dalkiliç, 2020). Considering the limited literature information, we have; it is among the remarkable findings that the physical activity levels of amateur esports players are below the 'adequate' condition (Simons et al., 2015). It is known that the daily playing time of amateur esports players tends to increase in parallel with their playing age. There are survey-based findings that the participation of amateur esports players in moderate-high intensity physical activity decreases with increasing daily playing time (Harding and Noorbhai, 2021). On the contrary, it is known that the awareness of the holistic physical-mental health is higher in professional-level esports players (Giakoni-Ramírez et al., 2022). The findings of the survey-based study on the physical activity levels of professional esports players show that they are physically active at an advanced level and their moderate-high intensity physical activity scores are high (McNulty et al., 2023). This finding shows us that esports athletes who are in the process of 'professionalization' have a high level of awareness about exercise.

Furthermore, although the literature on sleep patterns and chronotypes of esports players is remarkably limited, there are some critical messages underlying the limited findings. One study reported that 'Sleep quality is positively associated with mental health but negatively associated with video game playing intensity' with strong findings (Altintas et al., 2019). Moreover, another study suggests that increased video game exposure not only impairs sleep quality but also impairs cognitive abilities after a period of disturbed sleep (Peracchia and Curcio, 2018). It was previously revealed that the sleep arrangements of the esports player are affected by the chronotype features (Gomes et al., 2021). A few studies on esports players indicated that the athletes are more likely to show evening-chronotype characteristics (Gomes et al., 2021; Lee et al., 2021; Pereira et al., 2022). Thus, earlier-scheduled competitions may cause a decrease in-game performance (Lee et al., 2021). Considering the literature information presented above, there is a lack of research evaluating the relationship

between the chronotypes, circadian rhythms, and physical activity levels of esports players, which occur due to their lifestyles adapted to the rhythm of the game, from a comprehensive perspective.

Based on this information, we aimed to answer the following hypotheses in our study with a large group of participants, ı) that there may be a relationship between chronotypes and playing time of young esports players, ıı) there may be a relationship between the physical activity levels of young esports players and their playing time and, ııı) there may be a relationship between moderate and high intensity physical activity participation and chronotypes of esports players.

Method

Subjects

The participants in this study group included 190 participants aged 17 to 24 who are interested in esports and live in different regions of Turkey. A web-based survey was used to obtain data from esports players who participated in esports education. As stated by McKay et al. (2022), the esports players gathered in this study can be classified as Tier 2 and Tier 1 representing "Trained/Development" players who compete on the local level (McKay et al., 2022), or they are 'hardcore' gamers (Scharkow et al., 2015; Toth et al., 2021). During the preliminary review of the collected data, it was realized that the answers/values (about to the MEQ and IPAQ) given by some participants may need to be revised. Accordingly, the following exclusion criteria were applied to make the data and results more reliable; I) Participants who reported playing games for more than 16 hours per day and reported vigorous physical activity 6 days per week and 3 hours (or more) per day and moderate physical activity 6 days per week and 3 hours (or more) per day. II) Participants who reported playing games for more than 16 hours per day and reported vigorous physical activity 6 days per week and 3 hours (or more) per day. These exclusion criteria are discussed further in the limitations section. All subjects were made aware of the methods and provided signed informed consent to participate. Furthermore, parental consent was collected in addition to the consent forms for participants under the age of 18. All procedures and the experimental design were approved by the University's Ethics Committee (on the title page). The study protocol adheres to the most recent version of the Helsinki Declaration.

Data Collections

The research data were gathered via a web-based survey from esports players who had received esports education, trained/played on a regular basis, and agreed to participate in the study (https://forms.gle/vD4xvCxcw3giZy9s6).

Demographic Form

Using the survey questions developed for the participants, demographic information (gender, age, the city with whom they live, etc.) and game-playing time (daily game-playing hours and number of years playing games) were collected.

International Physical Activity Questionnaire-Short Form (IPAQ-SF)

It is divided into four sections and seven questions, with the questions asking about the participant's high-intensity, moderate-intensity, and low-intensity activities in the previous week. The responses provided allow the individuals' physical activity levels to be indirectly calculated in MET (min/week). Physical activity levels were divided into three categories: low (< 600 MET min/week), moderate (600-3000 MET min/week), and high (> 3000 MET min/week). Much research has proven that the form is accurate and reliable for evaluating physical activity levels (Craig et al., 2003; Saglam et al., 2010). Saglam conducted validity and reliability research in the Turkish version of the IPAQ (Saglam et al., 2010).

Morningness-Eveningness Questionnaire (MEQ)

Horne and Ostberg created the Morning-Evening Questionnaire to determine chronotypes of individuals (Horne and Östberg, 1976). Turkish adaptation of this original scale was performed by Özdalyan et al. (2021). The MEQ is made up of 19 items. Fourteen of the items are multiple-choice. The other five items include time scales that participants were asked to mark at a convenient time point for them. Participants get a score according to their reply on each 19 item and the MEQ scale score is achieved by the sum of these 19 scores. Whilst the lower MEQ scores are related to the eveningness chronotype, the higher scores are associated with the morningness chronotype. At last, individuals are separated into five different chronotype groups (definitely evening type, moderately evening type, neither type, moderately morning type, definitely morning type) according to their MEQ scores.

In this study, according to the scores of the Turkish version of the MEQ, the five groups could not be compared with each other due to the very low number of participants in the " definitely evening type" and "definitely morning type" chronotypes. Instead, consistent with previous studies, "definitely evening type" and "moderately evening type" groups were considered together and renamed as "evening type". The same process was applied to "moderately morning type" and "definitely morning type" groups and they were addressed as "morning type". Hence participants were classified into three chronotype groups (morning type, neither type, and evening type) rather than five, and analyses were carried out (Agargun et al., 2007; Caci et al., 2009; Lee et al., 2014; Özdalyan et al., 2021).

Statistical Analysis

The analyses were conducted on the remaining 158 participants after the exclusion criteria were applied. Because of the large sample size, normality of assumption was interpreted in conjunction with Skewness and Kurtosis values (Field, 2013) on IPAQ (MET-min/week), and gaming duration (Gaming Year, Daily, Gaming Hours) of three different chronotype groups (morning type, neither type and evening type). Because all Skewness and Kurtosis values ensure the normality assumption, data were separately analyzed with parametric test for IPAQ and gaming duration using One-Way ANOVA to compare three different chronotype groups. Effect sizes calculated using ω values (√SSM-(dfM) MSR/SST + MSR) and were reported as estimations of the effect size of main effects. In addition, post-hoc comparisons were carried out to look at the changes in gaming year, daily gaming hours, and IPAQ scores between each chronotype. Because of the homogeneity problem Games Howell procedure was reported for MET scores. Furthermore, correlation analysis examined the relationship between age, gaming year, daily gaming, MEQ scores, and IPAQ scores.

Results

Participants' Demographic Information

A total of 158 participants (125 males, 33 females) completed the survey and were divided into three groups (11 Morning Type, 100 Neither Type, and 47 Evening Type) according to their morningness-eveningness questionnaire results (Table 1 and Fig. 1). Results showed that the majority of the esports players were male and neither type. It was also seen from the demographic information collected that the results of the participants' correction analyses showed that year of play was significantly associated with daily play r = .395, p < .001 (Table 2). As the participants' yearly game-playing time increases with age, their daily game-playing hours also increase.
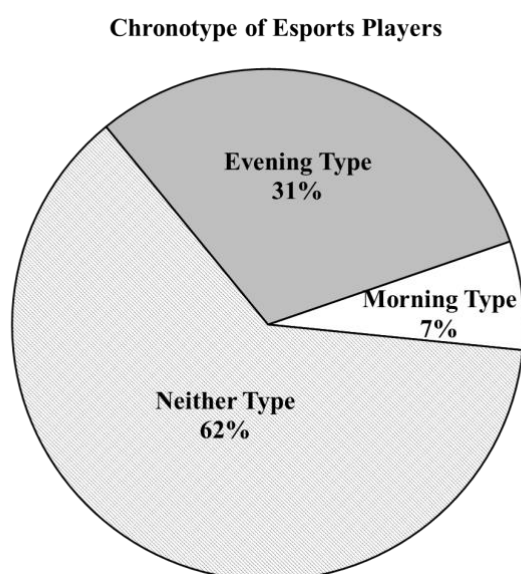
Figure 1. Chronotype of esports players.

Table 1. Descriptive table of participants

	Morning Type n=11	Neither Type n=100	Evening Type n=47	Total Group n=158
Age (year)	20.00±1.67	19.56±1.78	20.30±2.06	19.81±1.88
Gaming Year	7.27±5.42	8.37±3.29	7.81±4.34	8.13±3.79
Daily Gaming Hour	5.91±3.08	5.73±2.77	6.19±3.12	5.88±2.89
MET Scores (Min/Week)	2603.27±2095	3030.13±2654	1833.87±1856	2644.56±2454

The Relationship Between Participant Playing Time, MEQ Scores, and MET Scores

The correlation between the participants' gaming year, daily gaming hours, and their MEQ scores was examined; results showed a non-significant negative correlation in MEQ scores with gaming year $r = -.035$, $p = .66$, and daily gaming hours $= -.125$, $p = .12$ (Table 2). Total MET scores have a positive correlation with gaming year $r = .19$, $p = .81$, and daily gaming $r = .05$, $p = .52$ scores, but it is not significant (Table 2).

Table 2. The Correlation Analyses between IPAQ, gaming duration, MET Scores and MEQ scores.
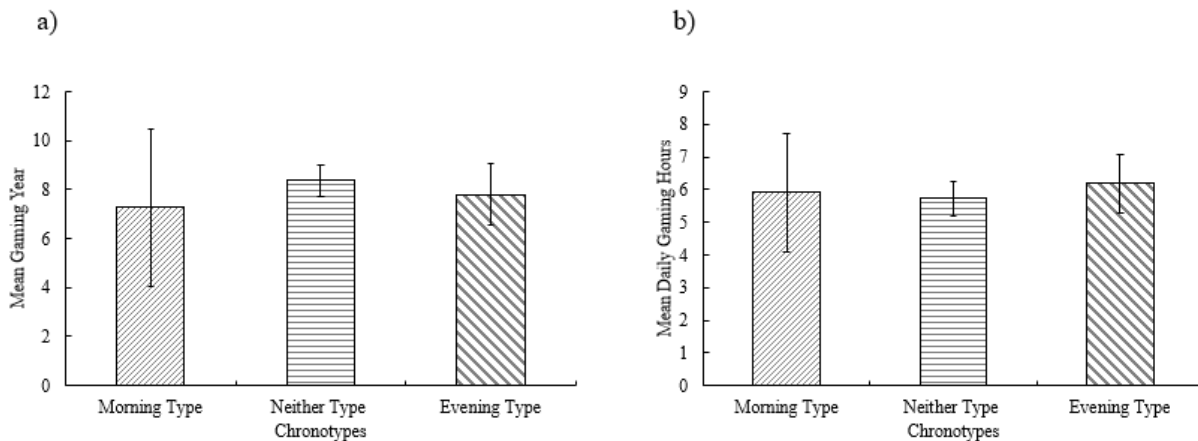
	n=158	Gaming Year	Daily Gaming Hours	MET Scores	MEQ Scores
Pearson's Correlation	Gaming Year	-	**.395**[**]	.019	-.035
	Daily Gaming Hours		-	.052	-.125
	MET Scores			-	.147
	MEQ Scores				-

**** $p < .001$

Effect of Chronotype on Participants' Gaming Duration

A one-way independent ANOVA was conducted to see the effect of chronotype on esports players' gaming year, and daily gaming hours. Levene's test showed that the assumption of homogeneity of variance has been violated for gaming year $F(2,155) = 7.68$, $p < .05$; so, Welch's *F*

is reported. Results showed that there is no significant effect of chronotype on gaming year $F_{(2, 24.65)} = 0.47$, $p = .63$, and daily gaming hours $F_{(2, 155)} = 0.41$, $p = .67$ (Figure 2).

Figure 2. a) Gaming year and **b)** daily gaming hours of participants in different chronotypes.

### Effect of Chronotype on Participants' Total MET Scores

A one-way independent ANOVA was conducted to see the effect of chronotype on esports players' total MET scores. Levene's test showed that the assumption of homogeneity of variance has been violated for total met scores $F_{(2,155)} = 3.56$, $p < .05$; so, Welch's F is reported. Results showed that at least one of the differences between the two chronotype groups is significantly different in total met scores, $F_{(2, 28.49)} = 4.89$, $p < .05$, $\omega^2 = .04$. The significant chronotype was examined with post hoc procedures by using the Games-Howell test. The follow-up comparisons showed that the differences between neither type and evening type, *(MD=1196.258, p<.01)* are significant (Figure 3).
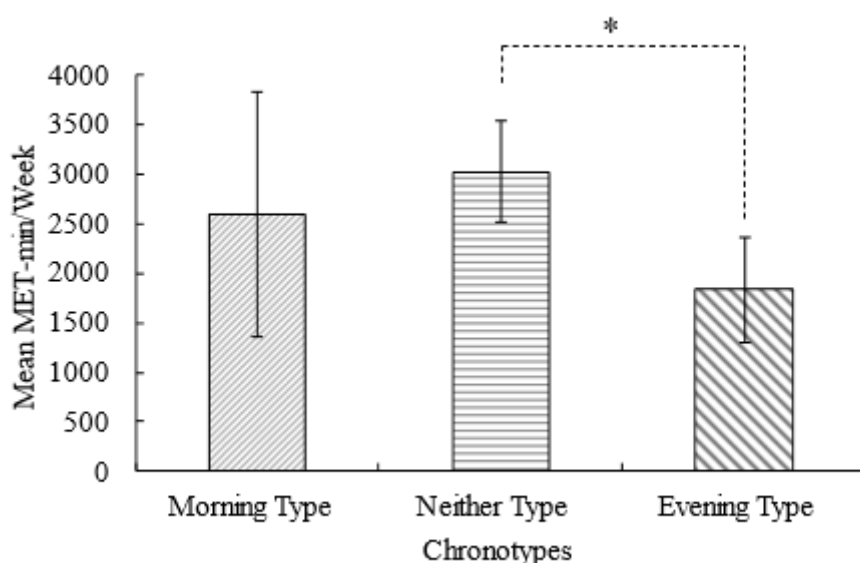
Figure 3. Mean MET scores of participants in different chronotypes. * *p< .05*

Relationship Between Participants' MEQ Scores and Total MET Scores

MEQ scores have a positive correlation with MET scores $r = .15$, $p = .07$, but this correlation is not significant (Figure 4).
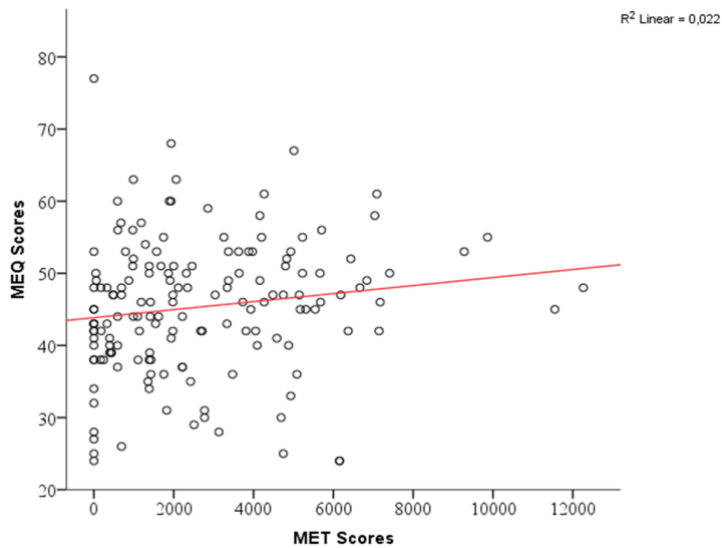
Figure 4. Correlation between MET scores and MEQ Scores.

Discussion

The aim of this study is to determine the chronotypes of young adults interested in esports at the national level according to their playing time and to examine the relationship between the effects of these chronotypes on playing time and the physical activity status of individuals. This study is also a descriptive study because it is one of the pioneering studies conducted at the national level with a high number of participants. According to the results of the study, it was determined that the chronotype distribution of esports players was primarily "neither type (62%)" and secondarily "evening type (31%)". In addition, another important finding of the study was that the physical activity levels of the participants were significantly different according to their chronotype. The results showed that the physical activity levels of the "neither type" were high (3030.13 MET-min/Week), the "morning type" (2603.27 MET-min/Week) and the "evening type" chronotype esport players were moderately active (1833.87 MET-min/Week). Although both "morning type" and "evening type" chronotypes are moderately active, the physical activity level of the "evening type" is the lowest.

Chronotype is a circadian rhythm indicator that is highly influenced by vital activities and environmental factors. There are research findings on the sleep-wake cycle and chronotype of long video games and screen exposure, especially in the evening hours (Kortesoja et al., 2023). In a study conducted on 1004 Finnish adolescents aged 15-20 years, it was shown that screen exposure based on digital media use at night causes shifts towards the "evening type" chronotype (Kortesoja et al.,

2023). It was also reported that the findings of poor sleep quality and feeling tired were higher in "evening type" participants. Another chronotype-based study conducted on 17 professional esports players, showed higher levels of disturbed sleep patterns, evening chronotype, and depression scores (Lee et al., 2021). On a physiological basis, the melatonin hormone is the most basic indicator of circadian rhythm, and it is known that the amount of its release will be suppressed with exposure to screen light at night and will cause the rhythm to shift (Silva et al., 2019). The small number of the "morning type" group in the findings of this study may be due to the lack of daylight due to compulsory indoor activities such as school during the day. On the other hand, prolonged screen exposure in the evening and at night may have caused a change in their chronotypes through the mechanism mentioned above.

One of the other important findings was that the participants of the "evening type" chronotype had significantly lower physical activity levels ($p < 0.05$). A review of chronotype-independent studies found a significant negative association between playing video games and high-vigorous activity behavior (Pelletier et al., 2020). In a comprehensive chronotype-related review study, the exercise habits and physical activity levels of the "morning type" chronotype were significantly higher than those of other chronotypes (Vitale and Weydahl, 2017). On the other hand, it is noted that the "evening type" chronotype has low physical activity levels (Sempere-Rubio et al., 2022), sleep latency (Glavin et al., 2021), and psychologically based behaviors such as feeling tired and fatigued during the day (Brückmann et al., 2020). Considering the literature, our findings suggest that motivation to participate in moderate and high-intensity physical activity may be negatively affected after the completion of activities that require a high cognitive workload such as esports (Mancı, 2022; Sousa et al., 2020). In addition, another critical issue is the need for studies detailing behavioral-based findings on the subject. The above-mentioned psychophysiological changes are more common in adolescent and young age participants (Sanz-Milone et al., 2021; Yen et al., 2019). Our findings reveal the need to raise awareness of national young esports players about factors that directly affect the circadian rhythm, general health, and quality of life, such as physical activity, healthy nutrition (especially during the game), sleep-wake cycle, and sleep quality. We believe that high performance in esports can emerge because of habits that are in line with sustainable health behaviors with sufficient physical activity levels and exercise capacity within a healthy life cycle. Therefore, the esports branch is not primarily based on 'physical exertion', but on 'structured physical exertion' in pre-game preparations to be successful. In support of this knowledge, study findings indicating that physically active esports players outperform other players have begun to find place in the establishing literature (Giakoni-Ramírez et al., 2022; McNulty et al., 2023; Nicholson et al., 2020).

Limitation

The confused/exaggerated answers of the participants included in the study to the questions in the IPAQ questionnaire suggest that the opinions of individuals interested in esports on the intensity of physical activity they do during the day are ambiguous. This may be because the esports branch, they are intensely interested in is performed while sitting. This situation should be studied in the future specifically on the physical activities of esports players and how they feel. In addition, when the chronotypes of the participants determined in our study were examined, the fact that there were very few "morning type" participants may have limited the results in comparing the groups with each other, although it created normative data.

Conclusion

The study findings provide normative information about the chronotype and physical activity levels of national youth esports players. It was observed that young esports players have a "neither type" and "evening type" chronotype rather than a "morning type" chronotype. We believe that this chronotype distribution negatively affects the physical activity levels of national youth esports players. The study also revealed the need to raise awareness among young esports players about physical activity levels and other vital activities. The federation, esports managers, and coaches should draw attention to this deficiency in esports players. We also think that our findings can be guided based on 'esports player health'. There is a need to examine the behavioral bases of the subject in future studies.

Ethics Statements: The Ethics Committee of the University approved all procedures and the experimental design (on the title page). The study protocol follows the latest version of the Declaration of Helsinki.

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