



Original Article

Effect of Morningness-Eveningness Chronotype on Daily and Weekly Fluctuations in Aggression in Preschool Children

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ABSTRACT

Background: The present study aimed at studying the morningness-eveningness chronotype (MEC) of daily and weekly biorhythm fluctuations in the aggression of preschool children.

Methods: This was a causal-comparative study. The statistical population was preschool children in Tehran. One hundred children were selected through purposive sampling. They were examined at different times of day (08:00, 10:00, 13:00 and 15:00) and different days of the week (Saturday, Sunday, Monday, Tuesday and Wednesday). The data collection tool used was the MEC questionnaire for children, a behavioral questionnaire for preschool children and a self-report questionnaire about aggression. The data was analyzed using mixed ANOVA.

Results: The results showed that the aggressive behavior of pre-school children in the educational environment varies throughout the day and week. Also, the aggressive performance of preschool children in the morning differed from that of mid-session children or evening-type children in the educational environment during the week ($P < 0.01$).

Conclusion: The results of the behavioral questionnaire showed that the effect of the group on the level of aggression was not significant, but the effect of the day of the week and time of day was significant.

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Introduction

Behavioral and psychological abnormalities and methods of coping with them are social issues in many societies. Aggression is one of the most common problems in children and adolescents and is a common reason for referring them to counseling and psychotherapy centers [1]. Aggression is a complex concept. On the one hand, it is influenced by psychological and situational factors and, on the other, genetic and biological factors play an important role in its establishment. It is difficult to provide a precise and objective definition of this

concept; however, Suter, Pihet, de Ridder, Zimmermann and Stephan [2] identified aggression as an antisocial behavior that is aimed at offending others directly or indirectly. Researchers believe aggression is a complex concept that is influenced by both situational, psychological and genetic factors [3].

Burk, Armstrong, Park, Zahn-Waxler, Klein and Essex [4] define aggression as behavior that could damage others. Various theories have addressed the cause of aggression. According to psychoanalytic theory, the cause of aggression is usually failure. In social learning theory, aggression is a response learned from observation or imitation [5]. Aggression appears to be an emotional function influenced by the sleep-wake cycle [6] and is also related to biorhythms [7].

Biorhythms are a set of continuous biological activities

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having a range or period that is statistically significant and are repeated for at least two successive periods. Based on the duration of the cycle, biorhythms can be divided into multi-category cycles, including ultradian (less than 20 h), circadian (20-28 h) and infradian rhythms (over 28 h) [8]. Confirmation of these internal cycles is when a person remains in place with constant lighting and temperature, he will repeat the period in about 24 hours [9].

The relationship between biorhythms and emotional behaviors such as anxiety [10], joy [11], depression and dysthymia [12] has been investigated and confirmed. Emotions, especially aggression, are affected by sleep-wake cycles [13] and sleep and wakefulness are the main factors creating a chronotype or preferences of individuals for sleeping and waking times [14]. Individuals can be classified into morning or evening types [15]. These individual differences have genetic origins and are created based on the endogenous biological clock [16]. They are influenced by the environment [17].

Studies have shown that children and adults are more of the morning type and adolescents are more of the evening type [18-21]. Evidence has shown that the chronotype is also influenced by age [22], intelligence [23] and environmental factors such as birth period (spring and summer with more hours of daylight or winter and autumn with more hours of darkness) [24]. Kang, Park, Sohn, Kim, Namkoong and Kim [25] found a relationship between day-night preferences and personality traits of impulsivity and excitement.

Schlarb, Sopp, Ambiel and Grünwald [26] showed that emotional and behavioral problems such as aggression or antisocial behavior are more common in evening-type subjects than in morning types. Vollmer and Randler [27] showed that morningness is associated with greater acceptance of social values (conservatism and superiority), while eveningness is related to the preference of personal values (acceptance of change and self-improvement). Diaz-Morales and Escribano [28] showed that students who are able to select the time of an activity according to a time preference will have a better opportunity for optimal performance and will show greater compatibility with school and family. It can be concluded that biorhythms effect the emotional performance of aggression in pre-school children and, thus, have individual differences.

Recent research has addressed the variables of aggression only slightly. The present study examined the interactive effects of time of day, day of the week and group (morningness-eveningness) in preschool children which have not been observed in previous studies. Because the emotional problems of preschool children are commonly caused by environmental challenges such as the beginning of the school day and mandatory discontinuation of sleep cycles, the current study addressed two issues. The first is whether or not aggression in preschool children differs by time of day and day of the week in the educational environment. The second is whether or not aggression in preschool children differs in the morning types compared to mid-

session or evening types.

Methods

The research method was causal-comparative and the statistical population was selected by purposive sampling. The sampling was initiated by searching preschool centers in District 8 of Tehran and selecting a preschool center which was open in both the morning and afternoon. A morningness-eveningness chronotype (MEC) questionnaire was completed for the children to select a group of morning-type children, a group of midsession-type children and a group of evening-type children.

The logic of estimating the sample size for the comparability of the research required at least 15 people in each group. In addition, G*Power (v. 3.0.10) software was used in the F-test groups with the following inputs: effect size of 0.33, alpha of 0.05 and a power of 0.95. This resulted in a sample size of 98, however, 100 subjects were selected. They were then investigated at different hours of the day (08:00, 10:00, 13:00 and 15:00) and different days of the week (Saturday, Sunday, Monday, Tuesday and Wednesday). Saturday is considered the first day of the week in Iran (equivalent to Monday in the west). The data collection tools were the Children's Chronotype Questionnaire, Behavioral Problem Questionnaire for Preschool Children and a self-report questionnaire on aggression.

Instruments

The Children's Chronotype Questionnaire (CCTQ) is used to measure the MEC of children and was developed by Werner, LeBourgeois, Geiger and Jenni [28]. The CCTQ is a multi-level questionnaire based on parental report and consists of three separate scales. On the M/E scale used in this study, there are 10 questions related to the preferential time for sleeping, waking, physical activity and sleeping after awakening of the child. The parents should take into account their child's behavior when answering these questions using a five-point Likert scale. Questions 1, 2, 8 and 9 are inversely scored. The scores range from 10 (complete morningness) to 49 (complete eveningness). Scores below 23 are rated as falling into the morningness chronotype, 24 to 32 into the midsession chronotype and over 33 into the eveningness chronotype.

Werner et al. [29] reported a Cronbach's alpha for this scale of 0.81, which is equal to the value reported by Carskadon, Vieira and Acebo [30]. The corrected mean correlation of each question for the total scale was 0.49 and its range was 0.31 to 0.71. These criteria indicate that the internal validity and consistency of this scale are in the optimal range. To use this scale in the present study, the questions were first translated by the English translator into Persian and then again into English. After removing existing flaws, the Persian text was again revised and submitted to a number of psychology professors for the confirmation of the content validity. It was approved after some modification.

The Behavioral Problem Questionnaire for Preschool Children was developed by Shahim [31] to measure behavioral problems in Iranian children aged 3-6 years. It is scored by the teacher on a scale from zero (never) to 2 (most of the time). The content validity of these items was approved by specialists and it was completed for 439 children (204 girls and 235 boys) for evaluation of its construct validity. The questionnaire consists of 27 items and exploratory factor analysis on the items resulted in three factors having a value greater than 1 (aggression and neglect, childish behavior & seclusion and anxiety) [32]. The factor load varied from 0.26 to 0.79. The correlation between factors showed a positive and moderate/weak correlation, which is comparable to similar behavioral lists. The reliability coefficients of the retest for the factors were 0.67, 0.44 and 0.58, respectively, and for the overall questionnaire was 0.64. The Cronbach's alpha for the factors was 0.89, 0.8 and 0.7, respectively, and for the overall test was 0.88. In the present study, Cronbach's alpha for factors was 0.81, 0.78, and 0.75, respectively, and for the questionnaire was 0.8, which indicates its appropriateness for implementation on the sample group. In the present study, the aggression level of the child was used to measure the child's aggression score.

The self-report questionnaire on aggression was used in addition to the aggression index extracted from the Child Behavior Questionnaire. A self-report questionnaire was used in this study to evaluate aggression in a child. This single-item questionnaire was developed using the emotion thermometer technique [33]. In this simple technique, three color images of emotions are used to grade the severity of an emotions and provide the possibility for respondents, especially children, who may be weak in the verbal expression of emotion, to express their emotional experiences in a certain and concrete manner. For the assessment of child aggression, four forms of the emotional thermometer were developed and colored to depict aggressive excitement, each of which on a separate piece of paper. On each paper, three gender-appropriate pictures of a child's face were drawn, one showing a calm face, one a confused face and one an

angry face. The child was asked to point to the face that accurately described her/his emotions. The background image (circle, triangle, semicircle, and cylinder) also was different between the four forms. The examination paper was shown to the child and the researcher explained: "Look carefully at yourself. To which picture is your current emotion best associated? Point to the best one. This one is angry, this one is confused and this one is calm". The calm picture was scored as 1 point, the confused picture as 2 points and the angry picture as 3 points. The retest validity assessment of this questionnaire resulted in a correlation coefficient of 0.55, which was significant at the 0.001 level and confirms the validity of the questionnaire. The convergent validity of this tool was 0.61 and was obtained by calculating its correlation coefficient with the subscale of aggression in the Behavioral Problem Questionnaire, which was significant at the 0.001 level and indicates acceptable validity. The data was analyzed by mixed ANOVA.

Results

Because two methods (self-report and observation) were used to investigate aggression in children, the analyses performed on each case are presented successively. The mean and standard deviation of child aggression by group for the self-report tool by hour of day and day of week are presented in Table 1.

Mixed ANOVA was used to calculate the responses and the results are reported in Table 2. Before performing this analysis, Mauchly's test was used to examine the data sphericity hypothesis, the results of which showed that this assumption holds for the daily cycle ($\chi^2=3.85$, $P=0.57$), but not for the weekly cycle ($\chi^2=21.33$, $P<0.01$) and its interaction versus the daily cycle ($\chi^2=170$, $P<0.001$). Hence, Greenhouse Geisser (GG) corrected values were used for ANOVA.

Table 2 shows that the interactive effect of the weekly versus daily (diurnal) cycles as well as the interactive effect of weekly versus daily (diurnal) cycle versus group on aggressive performance was significant using

Table 1: Mean (M) and standard deviation (SD) of child aggression from self-report tool as rated by time of day and day of week.

Group	Day of week	Hour of day							
		08:00		10:00		13:00		15:00	
		M	SD	M	SD	M	SD	M	SD
Morningness	Saturday	1.76	0.83	1.94	0.96	1.56	0.78	1.47	0.71
	Sunday	1.41	0.79	1.65	0.78	1.41	0.71	1.65	0.93
	Monday	1.82	0.95	1.94	0.74	1.53	0.8	1.29	0.47
	Tuesday	1.18	0.39	1.71	0.98	2	0.86	1.88	0.78
	Wednesday	1.65	0.6	0.35	0.49	1.88	0.78	1.78	0.75
Midsession	Saturday	1.63	0.74	1.68	0.86	1.84	0.75	1.61	0.72
	Sunday	1.68	0.8	1.84	1.04	1.7	0.88	1.72	0.77
	Monday	1.72	0.86	1.54	0.82	1.65	0.76	1.53	0.63
	Tuesday	1.6	0.86	1.42	0.75	1.54	0.75	0.89	0.79
	Wednesday	1.63	0.74	1.7	0.73	1.58	0.8	1.95	1.23
Evening	Saturday	1.85	0.88	1.46	0.5	1.69	0.78	1.65	0.68
	Sunday	1.62	0.75	1.69	0.61	1.42	0.64	1.5	0.81
	Monday	1.42	0.7	1.85	0.78	1.35	0.48	1.38	0.63
	Tuesday	1.46	0.7	1.73	0.72	1.5	0.64	1.46	0.7
	Wednesday	1.69	0.78	1.42	0.64	1.5	0.7	1.38	0.49

Table 2: Results of mixed ANOVA for the difference between groups on self-reported aggression by day and week.

Resource		Sum of squares	Degrees of freedom	Mean of squares	F	Sig.	Eta-squared
Inter-subject	Group	5.33	2	2.66	0.77	0.64	0.01
	Error	335	97	3.45			
Intra-subject	Weekly cycle	1.83	3.61	0.5	0.78	0.52	0.008
	Weekly cycle × group	3.78	7.22	0.52	0.8	0.58	0.01
	Error	227.17	350.21	0.65			
	Diurnal cycle	0.77	3	0.25	0.42	0.73	0.004
	Diurnal cycle × group	5.16	6	0.86	1.42	.2	0.03
	Error	175.87	291	0.6			
	Weekly cycle × diurnal cycle	15.77	.28	1.7	3.28	0.001	0.03
	Weekly cycle × diurnal cycle × group	23.09	18.56	1.24	2.4	0.001	0.05
Error	466	900	0.51				

the self-report tool. The results of mixed ANOVA show that the interactive effect of weekly versus diurnal cycles is significant for the self-report tool ($P < 0.001$). This means that preschool children show varying degrees of aggression according to time of day on different days. Figure 1 shows this interactive effect.

Figure 1 shows that the aggression level of children varied by time of day and day of week. For example, preschool children showed the highest aggression at 08:00 on Saturday and the lowest aggression at that same hour on Tuesday. On the first and last days of the week, the aggression level of the children was similar at different hours of the day, but, in the middle of the week, especially on Monday and Tuesday, their aggression level varied over the course of the day. As seen in the figure, the highest level of aggression was observed on Saturday at 08:00 and the lowest level on Monday at 15:00. The eta-squared for the interactive effect of daily versus weekly cycles on aggression suggests that about 3% of changes in aggression in preschool children as observed by the self-report tool can be attributed to the interactive effect of these two variables.

The results in Table 2 reveal that the interactive effect of group versus weekly cycle versus diurnal cycle

on aggression was significant in the self-report tool ($P < 0.001$). This means that the morning, midsession and evening groups of children showed different aggression levels on different days of the week. To illustrate this interactive effect, the interaction of the weekly versus daily cycles are presented in Figures 2, 3 and 4 for the three groups.

The figures show that the morning-, midsession- and evening-type children displayed different patterns of aggression according to the self-test tool at different times of day on different days of the week. For example, aggression in morning-type children at different hours on different days of the week fluctuated greatly and did not show a stable pattern, but in the midsession-type group (except at 15:00) and evening-type group (except at 10:00), the level of aggression on different days of the week was relatively similar.

Another important finding was that in the evening-type group, there is a clear pattern of aggression among children at different times of the week, which is not seen in the morning- and evening-type groups. On Saturday, evening-type children were most aggressive at 08:00, 13:00 and 15:00. This gradually decreased by Monday and then increased slightly for the final days of the week;

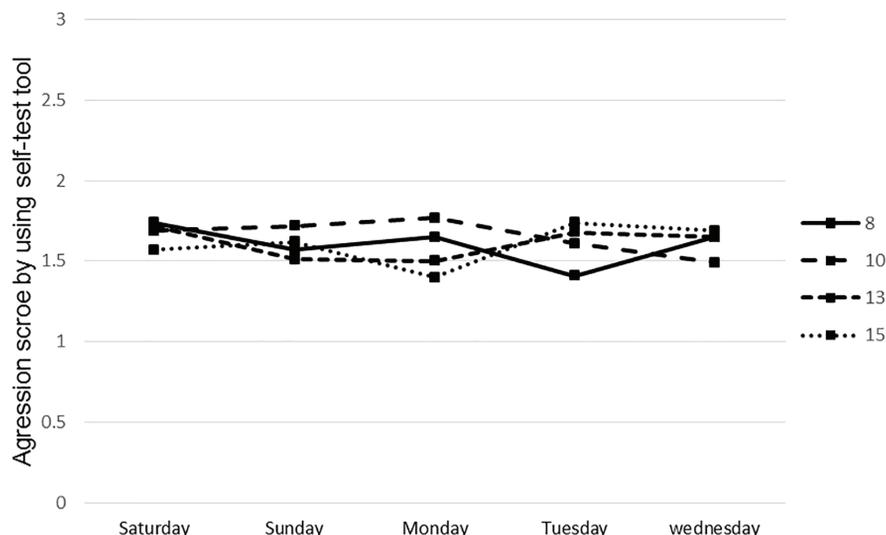


Figure 1: Interactive effect of weekly and daily cycles on aggressive performance according to self-report tool.

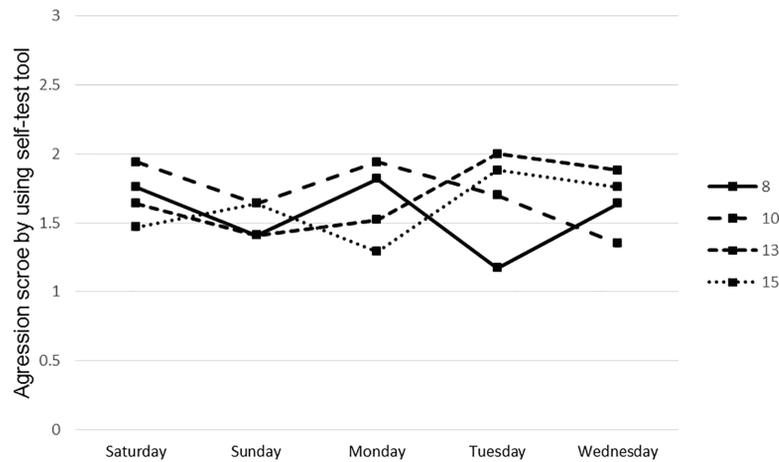


Figure 2: Interactive effect of weekly vs. daily cycles on aggression by self-report tool for morning-type children.

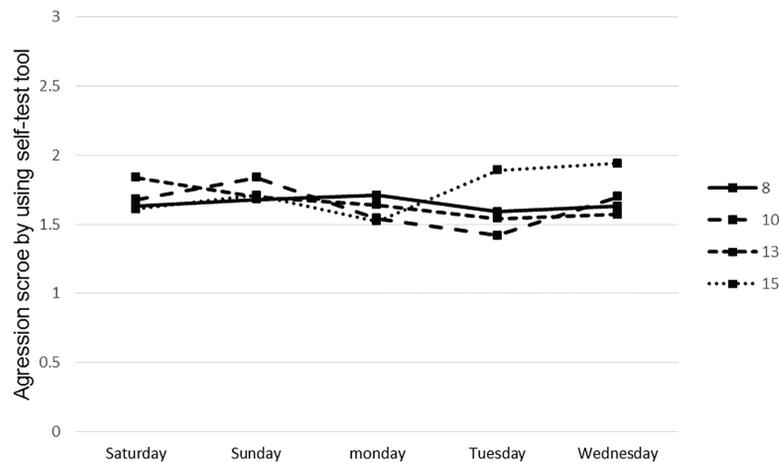


Figure 3: Interactive effect of weekly vs. daily cycles on aggression by self-report tool for midsession-type children.

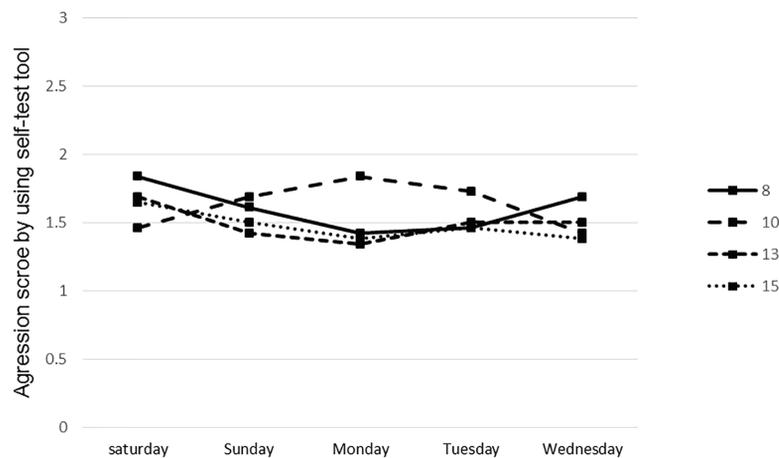


Figure 4: Interactive effect of weekly vs. daily cycles on aggression by self-report tool for evening-type children.

however, this pattern was reversed for 10:00 and was lowest on the first day of the week, increased at mid-week and fell in the final days of the week.

Analysis of these graphs indicates that the highest and lowest levels of aggression were observed in one group and in one day. The lowest level of aggression was in the morning-type group at 08:00 on Tuesday and the highest was for the same group at 10:00 Tuesday. The eta-squared for the interactive effect of daily versus

weekly cycles versus group on aggression suggests that about 5% of changes in aggression in preschool children according to the self-report tool can be explained the interactive effect of these three variables.

Analysis of aggression scores from the self-report tool and the results of mixed ANOVA show that based on the non-significance of the main effects of weekly and daily cycles on aggression, there is insufficient evidence to show a difference in aggressive behavior of preschool

children in the educational environment according to time of day and day of week. However, considering the significance of the interactive effects of group versus daily cycles versus weekly cycles on aggression using the self-report tool, it can be concluded that the aggressive behavior of morning-type preschool children differs from the midsession- and evening-type children in the educational environment according to time of day and day of week. The mean and standard deviation of child aggression by group according to time of day and day of week using the observation tool are presented in Table 3.

The results of mixed ANOVA for the effect of the group and daily and weekly cycles on child aggression using the observation tool are reported in Table 4. Before performing this analysis, the Mauchly's test was used to examine the data sphericity hypothesis, the results of which showed that this assumption does not hold for any of the intra-subject variables and their interactions ($\chi^2=28.53$, $P<0.001$ for the weekly cycle, $\chi^2=53.56$, $P<0.001$ for the daily cycle and $\chi^2=244$, $P<0.001$ for their interactions). Hence, the GG corrected values were used for the ANOVA calculations.

Table 4 shows that the main effects of the weekly cycle, daily cycle, the interactive effect of the weekly cycle versus group and of the weekly versus daily cycles on aggression are significant according to the observation

tool. The main effect of the weekly cycle was significant for aggression ($p<0.05$); preschool children generally showed different levels of aggression on different days of the week. The Bonferroni post hoc test showed that this difference was significant for Monday versus Wednesday. Figure 5 shows the main effect of the weekly cycle on the aggression level by the observation tool.

Figure 5 shows that the highest aggression was observed on Monday by the observation tool and the lowest was observed on Wednesday and that the difference between these two days was significant. The eta-squared for the main effect of weekly cycle on aggressive behavior by the observation tool indicates that about 3% of changes in aggression among pre-school children can be explained by the main effects of this variable. The results presented in Table 4 indicate that the interactive effect of group versus weekly cycle on aggression scores by the observation tool was significant ($P<0.01$). The different groups of children showed different aggression levels on different days of the week. Figure 6 shows the interactive effect of group versus weekly cycle on the aggression scores by using the observation tool. To improve the simplicity and comparability of the groups, the scores on the vertical axis are not zero.

As shown in Figure 6, the morning-, midsession- and evening-type children showed significant differences in

Table 3: Mean (M) and standard deviation (SD) of child aggression by group for time of day and day of week using the observation tool.

Group	Day of week	Hour of day							
		08:00		10:00		13:00		15:00	
		M	SD	M	SD	M	SD	M	SD
Morning	Saturday	13.23	1.6	14.23	2.5	14.23	1.78	13.52	1.3
	Sunday	13.29	1.2	14.64	2.2	14	1.7	14.29	1.6
	Monday	13.94	2.3	14.35	1.9	14.94	2.1	14.41	2.2
	Tuesday	13.7	2.1	15	2.4	15.47	2.9	15.29	2.4
	Wednesday	13.58	1.2	13.17	0.88	13.7	1.8	13.94	2.3
Midsession	Saturday	14.7	2.2	14.45	2.2	15	2.7	14.87	2.6
	Sunday	13.31	1.2	14.26	1.8	14.94	3.5	14.78	3.2
	Monday	14.15	2.7	14.22	2.7	14.15	2	15	2.4
	Tuesday	13.24	1.1	14.36	2.5	14	2.8	14.7	2.7
	Wednesday	13.47	1.6	13.47	1.5	14.43	3.2	15.61	3.2
Evening	Saturday	13.8	3.6	13.53	2.4	14.61	1.9	14.57	2
	Sunday	13.65	1.3	14.26	1.8	13.88	1.7	13.69	2.8
	Monday	14.3	4.2	15.34	3.6	14	1.8	15.15	3.8
	Tuesday	13.5	1.7	13.57	1.4	14	1.37	13.57	1.74
	Wednesday	13.69	2.5	13.61	1.2	13.3	1.73	14.23	3.6

Table 4: Results of mixed ANOVA for difference between groups on aggression by time of day and day of week using the observation tool.

Resource		Sum of squares	Degrees of freedom	Mean of squares	F	Sig.	Eta-squared
Inter-subject	Group	41.14	2	20.57	0.44	0.64	0.009
	Error	4476	97	46.15			
Intra-subject	Weekly cycle	64.79	3.5	18.51	2.82	0.05	0.03
	Weekly cycle × group	129.86	7	18.54	2.82	0.01	0.05
	Error	2226	339.54	6.55			
	Diurnal cycle	143.63	2.31	62.14	10	0.001	0.09
	Diurnal cycle × group	52.1	4.62	11.27	1.82	0.11	0.03
	Error	1384.68	224.19	6.17			
	Weekly cycle × diurnal cycle	71.5	8.16	8.76	1.93	0.05	0.02
	Weekly cycle × diurnal cycle × group	11.42	16.32	6.82	1.51	0.09	0.03
	Error	3579	791.5	4.52			

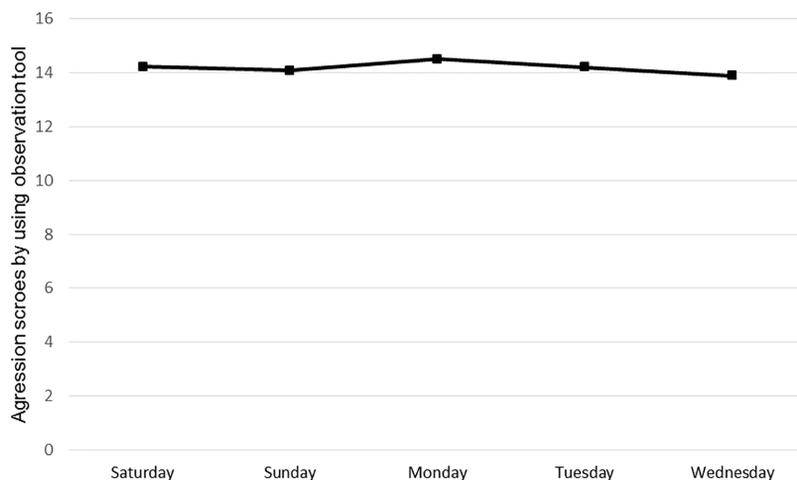


Figure 5. Main effect of weekly cycle on aggression by pre-school children by the observation tool.

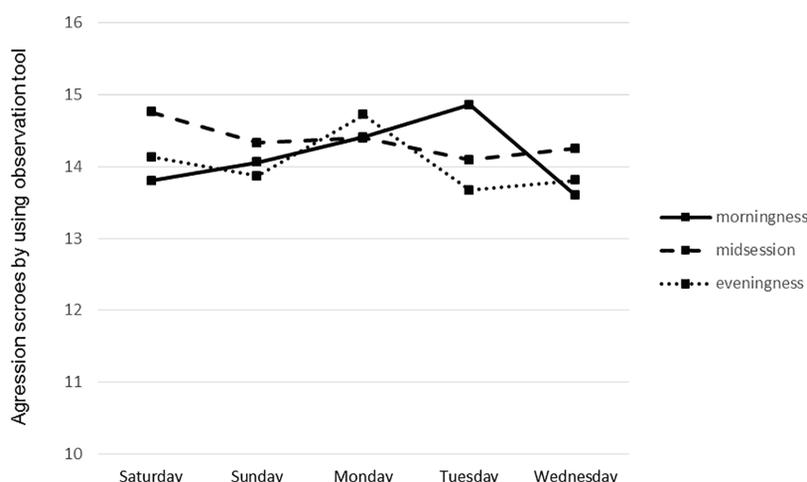


Figure 6. Interactive effect of weekly cycle vs. group on aggressive behavior by preschool children from the observation tool.

aggression level depending upon the day of the week. The highest aggression of the morning-type group was on Tuesday and the lowest level was observed for the evening-type on Tuesday. This group showed more aggression on Monday. On Monday, the aggression levels of the three groups were relatively similar, while on other days, especially on Saturday and Tuesday, they were very different. Aggression in the midsession group showed less fluctuation than in the other two groups during the week. The figure shows that the highest level of aggression was for the morning-type children and the lowest was for the same group on Wednesday. The eta-squared for the weekly cycle versus group for aggressive behavior suggests that about 5% of the changes in aggression by preschool children were explained using the observation tool by the interactive effect of these two variables.

The results of mixed ANOVA (Table 4) show that the main effect of the daily cycle on aggression by preschool children was significant ($P < 0.001$); these children generally showed different levels of aggression at different times the day. The Bonferroni post hoc test revealed that this difference was significant for 08:00 versus all other times. Figure 7 shows the main effect of daily cycle on aggression level using the observation tool.

Figure 7 reveals that the lowest aggression level was at 08:00 and the highest was at 15:00. In other words, aggression gradually increased throughout the day. The eta-square for the main effect of daily cycle on aggression by the observation tool suggests that about 9% of changes in aggression in preschool children can be explained using the observation tool by this variable. Table 4 shows that the interactive effect of weekly cycle versus daily cycle on aggression by the observation tool was significant ($P < 0.05$). Thus, preschool children generally showed different levels of aggression at different time on different days, regardless of the group. Figure 8 shows the interactive effect of weekly cycles versus daily cycles on the aggression level using the observation tool. For simplicity and comparability of groups, the scores of the vertical axis are not zero.

As shown in Figure 8, the aggression rates for preschool children differed at different times and on different days. The lowest aggression level occurred at 08:00 every day except Wednesday. The aggression level of aggression was on Monday was higher at all hours than on other days. Aggression was high at 15:00 every day and did not show a significant decrease; however, it declined at 10:00 on Wednesday. Analysis of the

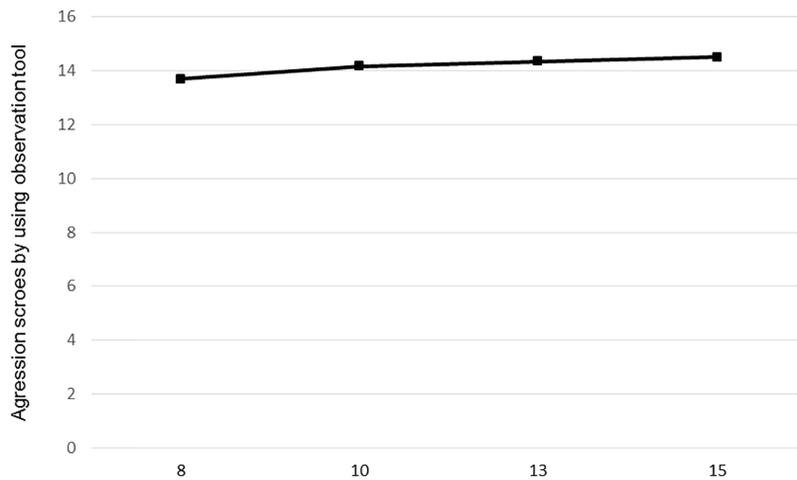


Figure 7: Effect of main daily cycle on aggression by preschool children using the observation tool.

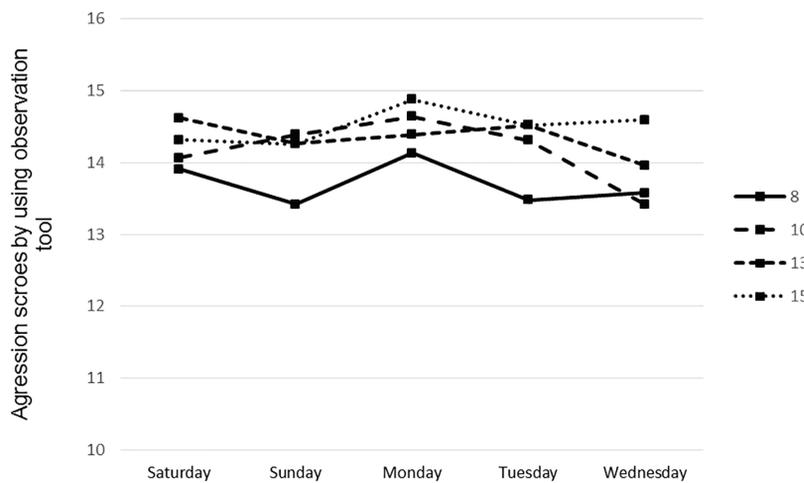


Figure 8: Interactive effect of weekly vs. daily cycles on aggression level using the observation tool.

figure shows that the highest levels of aggression were observed on Monday at 15:00, the lowest on Sunday at 08:00 and on Wednesday at 10:00. The eta-squared for this interactive effect suggests that about 2% of the changes in aggression by preschool children using the observation tool could be explained by the interactive effect of these two variables.

The results of analysis on aggression scores using the observation tool and the results of the mixed ANOVA indicate that the main and interactive effects of weekly versus daily cycles on aggression was different in the educational environment using the observation tool. The interactive effects of group versus weekly cycle on aggression using the observation tool showed that aggression by pre-school morning-type children was different from that of the midsession-type and evening-type children in the educational environment during the week.

Discussion

This study was undertaken to study the daily and weekly biorhythms of aggressive behavior in preschool children based on the MEC. The results of this study were derived

from the self-report questionnaire and observation tools for measuring aggression. The results of the self-report tool showed that none of the main effects of group, day of week and time of day are significant for aggression. The interactive effects of week versus group and time of day versus group were not significant for aggression; however, the interactive effects of day of week versus time of day and day of week versus time of day versus group were significant for the level of aggression.

The results of the observation tool showed that the main effect of group on aggression level was not significant, but the main effects of day of week and times of day were significant. The interactive effect of day of week versus group and day of week versus time of day were significant, but the interactive effect of time of day versus group and day of week versus time of day versus group were not significant.

Because of the differences in the two tools for documenting the results, children were shown three images of human faces (aggressive, confused and calm) with which to express their own feelings. A possible explanation is the existence of bias in the children about expressing aggressive and confused faces. If they deemed the expressions of aggressive and confused emotions

as being unacceptable, they may have avoided them during games, assignments and the like. As a result, the children refused to choose the expressions of aggressive and confused. In addition, the results obtained using the self-report method are not sufficiently valid for minor subjects. Therefore, the results of the questionnaire and observation method were analyzed.

Analysis of data in response to the first issue showed that there was no difference in the aggressive behavior of preschool morning, midsession and evening chronotypes in children. This finding is not consistent with research by Adan et al. [15] which showed that individual differences affect biological and psychological performance. It also is not also consistent with the findings of Diaz-Morales and Escribano [28], Chung et al. [14], Muro et al. [22], Wright et al. [6] and Goldstein et al. [23]. Diaz-Morales and Escribano [28] showed in their study that personality and health styles of morning-types and evening-types are important factors related to adaptation and mood in school and family. Chung et al. [14] found that sleep hygiene and the mood played a role in the chronotype and there is a relationship between moods in terms of sleeping and waking preference and the psychological clocks of individuals.

Muro et al. [22] showed that evening-type teenagers are more inclined to strong, variable feelings, riskiness and uninhibited emotions compared to the morning-type teenagers. Goldstein et al. [23] observed increased behavioral problems and inadaptability behavior for evening-type adolescents. Wright, Lowry and LeBourgeois [6] showed that the formation of a 24-hour cycle helps in recognizing emotions and inconsistency between a 24-hour cycle and sleep physiology leads to emotional dysfunction. The inconsistency in the research may be due to the fact that the research community was preschool children and the optimal time for psychological functioning in children is in the morning, but this is changes to evening for adolescents. This eveningness continues until the teenage years. The requirement of maximum wakefulness in the morning in children requires that they have appropriate sleep patterns and go to bed earlier. This frequently not the case because of lack of parental scheduling; thus, many children remain awake along with adults until late at night. This means that they cannot function properly in the morning. The children in the current study may fall such a category, causing bias in the results of the present study.

This finding is also consistent with those by Kang et al. [25], Selvi et al. [10] and Schlarb et al. [26], who showed that there is a significant relationship between sleeping and wakening preference and excitement, high impulsivity and behavioral problems in adolescents. These problems are more commonly observed in evening-type children than morning ones because, as mentioned, most adolescents are of the evening type and do not tend to wake early in the morning or maintain appropriate functioning at this time. When children are forced to wake up early for school and have had an insufficient amount of sleep, they show risky behavior such as arguments, aggression and smoking. Although

the studies of Kang et al. [25], Schlarb et al. [26] and Selvi et al. [10] are consistent with this study, the number of inconsistent studies suggest that the differences and biases can be attributed to the nature of the subjects of the present study, i.e., preschool children. The anticipated relationship between morningness, midsession-type and eveningness and aggressive behavior, has been confirmed in studies on adolescents. With regard to preschool children, the psychological chronotypes have not yet been proven. No relationship was found between psychological chronotypes and aggressive behavior.

Data analysis for the second question showed that aggressive behavior by morning-type preschool children differs from the midsession- and evening-types for time of day and day of week. This finding is consistent with that of Salmani et al. [7] who showed that the mean aggression score in college students is higher during the full moon than during the new moon. Also, the mean scores of aggression and anger subscales were significantly higher during the full moon than during the new moon.

As is consistent with the findings of this study, Wickersham [19] showed that daily fluctuations effect psychological functioning. This is consistent with the findings of Selvi et al. [10] who showed that evening-type subjects have more disorders in daily functions. Vollmer and Randler [27] also showed that a tendency toward morning-type increases the prioritization of social values like change and adapting oneself to others. On the other hand, the morning-type relates to adhering to personal values and prioritizing others values as being of secondary importance. If self-acceptance is threatened, increased aggressiveness is shown without regard for social values.

Data analysis in response to the second issue also showed that the aggression by preschool children was highest on Mondays and lowest on Wednesdays. The findings of this study for day of week versus group interaction showed that the lowest aggression among preschool children was at 08:00 and the highest was at 15:00. Because preschool children show the highest memory function in the early hours of the day, they are more successful in their assignments and lessons and, therefore, feel less aggression and anxiety.

Conclusion

The results of this study showed that none of the main effects of group, day of week and time of day are significant for aggression. The interactive effects of week versus group and time of day versus group were not significant for aggression; however, the interactive effects of day of week versus time of day and day of week versus time of day versus group were significant for the level of aggression. There for, the results recommend investigation into the effect of changing sleep patterns on the psychological variables in the future. It should be determined whether or not changes in sleep pattern from evening to morning in evening-type subjects with risky behavior affects their impulsive behavior.

In the view of the researcher, awareness of individual differences in morningness-eveningness can be effective when designing preventive health programs for every chronotype.

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