

The Role of Biomotor Skills and Attention in Shooting Performance: A Predictive Study

Atıcılık Performansında Biyomotorsal Beceriler ve Dikkatin Rolü: Performans Yordama Çalışması

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Abstract

Shooting is a precision sport that demands both mental and physical control, where variables such as attention, balance, grip strength, and training experience play an essential role in performance. In this context, this study investigated the predictive effects of biomotor skills and attentional variables on shooting accuracy. A total of 22 volunteer shooting athletes aged between 15 and 27 years, selected through convenience sampling, participated in the study. Data collection tools included the "Medicine Ball Throw Test," "Hand Grip Strength Test," "Flamingo Balance Test," "Stroop Test," and the "Shooting Accuracy Test." All measurements were conducted in accordance with standard protocols across two separate sessions, and the data were analyzed using stepwise multiple regression analysis. The findings indicated that sports experience, dominant-hand grip strength, and balance ability significantly predicted shooting accuracy. Among these, sports experience emerged as the strongest predictor, while greater dominant-hand grip strength and fewer balance test errors were associated with improved performance. In contrast, the proportional stroop effect (PSE) and the medicine ball throw test did not demonstrate significant predictive value. These results suggest that achieving high performance in shooting is not solely dependent on cognitive processes such as attention but also requires the development of experience, postural stability, and upper extremity strength. Therefore, training programs that incorporate both physical and cognitive components may maximize shooting performance.

Keywords: Executive functioning, Motor control, Motor skills, Postural stability, Shooting accuracy

Öz

Atıcılık dikkat, denge, kavrama kuvveti ve antrenman deneyimi gibi değişkenlerin performansta önemli rol oynadığı, hem zihinsel hem de fiziksel kontrol gerektiren bir hassasiyet sporudur. Bu bağlamda, bu çalışma biyomotor beceriler ve dikkat değişkenlerinin atış isabeti üzerindeki yordayıcı etkilerini incelemiştir. Çalışmaya, kolayda örnekleme yöntemiyle seçilen 15 ila 27 yaşları arasında 22 gönüllü sporcu katılmıştır. Veri toplama araçları olarak "Sağlık Topu Fırlatma Testi," "El Kavrama Kuvveti Testi," "Flamingo Denge Testi," "Stroop Testi" ve "Atış İsbetisi Testi" kullanılmıştır. Tüm ölçümler standart protokollere uygun olarak iki ayrı oturumda gerçekleştirilmiş ve veriler adım adım çoklu regresyon analizi ile değerlendirilmiştir. Bulgular, spor deneyimi, baskın el kavrama kuvveti ve denge becerisinin atış isabetini anlamlı şekilde yordadığını göstermiştir. Bunlar arasında spor deneyimi en güçlü yordayıcı olarak öne çıkarken, baskın el kavrama kuvvetinin artışı ve denge testindeki hata sayısının azalması performansı geliştirmiştir. Buna karşılık, orantısız stroop etkisi ve sağlık topu fırlatma testi anlamlı bir yordama gücü göstermemiştir. Bu sonuçlar, atıcılıkta yüksek performansa ulaşmanın yalnızca dikkat gibi bilişsel süreçlere değil, aynı zamanda deneyim, postürel stabilite ve üst ekstremitte kuvvetinin geliştirilmesine de bağlı olduğunu göstermektedir. Dolayısıyla, antrenman programlarının hem fiziksel hem de bilişsel bileşenleri içerecek şekilde tasarlanması atış performansını en üst düzeye çıkarabilir.

Anahtar Kelimeler: Yürütücü işlev, Motor kontrol, Motor beceriler, Postürel stabilite, Atış isabeti

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Introduction

Shooting is a precision-based sport that involves aiming at fixed or moving targets with firearms such as pistols and rifles, emphasizing both mental and physical control skills (Ball et al., 2003). Although there are more than 15 shooting categories, air pistol and air rifle events are among the most common disciplines, allowing participation across all age groups (Zatsiorsky & Aktov, 1990). Key factors contributing to success in shooting include postural balance (Mononen et al., 2007), proper body posture, trigger control, endurance, and efficiency (Hawkins & Sefton, 2011; Konttinen et al., 2000). While the importance of mental performance in shooting is widely acknowledged, achieving accurate and successful shots requires optimal control over body movements and sway (Konttinen et al., 2003; Laaksonen et al., 2018). Individuals are physical and physiological beings and possess mental and emotional dimensions (Çakır et al., 2025). Therefore, an athlete's psychological and emotional state can be critical to their attention and overall performance (Coşkuntürk et al., 2023).

Attention can be defined as the ability to focus on specific targets during conscious awareness (Tanrıdağ, 1994). It also encompasses cognitive processes such as filtering perceived information, evaluating stimuli, and regulating emotional responses. The ability to control thought processes and concentrate on a specific task is considered a fundamental element for optimal performance in sports (Williams, 1993). Attention allows individuals to distinguish one stimulus from another and selectively adjust their perceptual threshold. It is generally assumed that all individuals possess attentional capacity; otherwise, even the simplest tasks may become difficult to comprehend (Meriçli, 2010). Increased concentration at the onset of a shot may indicate heightened mental activity. In athletes with prolonged shooting experience, factors such as fatigue, posture, arm positioning, and body sway during trigger pull have also been reported to influence performance (Vuillerme & Nougier, 2003). Studies on mental skills and attention have shown that, particularly in elite archers, factors such as gender, discipline, and mental techniques account for approximately 52% of the variance in archery performance (Öner & Cankurtaran, 2020). An increase in attentional level enhances general alertness and positively impacts athletic performance (Ball et al., 2003). Enhanced attention improves athletes' focus, allowing them to perform more consistently and at a higher quality during competition. These findings highlight the critical role of attention in achieving success in sports.

Muscle fatigue has been found to affect postural control (Ball et al., 2003). It has been reported that the performance of rifle shooters decreases as body sway increases, while skilled shooters exhibit significantly less body sway (Mononen et al., 2003). Balance is important for athletic performance. Proper balance helps maintain the body's center of mass against gravitational force and reduces postural sway, allowing technical skills to be executed more effectively (Deniz & Kayatekin, 2023). In a study by Hung et al. (2021), it was concluded that balance training affected shooting success and led to improvements in reaction times. According to coaches and athletes in target sports, postural balance is a crucial component of shooting performance. This view is supported by several studies (Aalto et al., 1990; Zatsiorsky & Aktov, 1990; Era et al., 1996; Konttinen et al., 1998; Mononen et al., 2007).

Research on the factors influencing shooting performance has yielded different results. A study conducted with elite handball players reported that upper extremity neuromuscular control and hand grip strength did not predict shooting accuracy. In contrast, sports experience was identified as a decisive factor (Asan, 2023). In another study with young soccer players, lower extremity neuromuscular control and stability

test scores were not significantly associated with biomotor performance (Asan et al., 2025). These findings suggest that athletic performance depends on isolated motor skills, experience, technical proficiency, and sport-specific integrative characteristics.

As in all sports, anthropometric and morphological characteristics such as height, body mass, body fat percentage, and limb length are important in determining an athlete's success in shooting sports. The most significant factors affecting upper extremity functionality are hand grip strength and neuromuscular control. Hand grip strength is commonly used to assess upper extremity performance (Narin et al., 2009). In shooting sports, grip strength is a vital component of general strength and an essential element of shooting technique for pistol and rifle shooters (Erdoğan et al., 2016). In a study examining the effects of certain physiological and motor characteristics on shooting performance in air rifle athletes, statistically significant moderate positive correlations were found between performance and vital capacity, flexibility, right and left-hand grip strength, and back and leg strength (Ertürk et al., 2022). In this context, the present study aims to determine the effects of physical factors such as balance, upper extremity strength, and cognitive processes like attention on shooting performance. In addition, the findings are expected to provide current insights for coaches and athletes to enhance shooting efficiency and contribute to developing training programs aligned with these results.

Materials and Methods

Research Design

This study employed a predictive correlational research design, one of the relational survey models. In predictive designs, the goal is to estimate the unobserved values of a variable based on other observable and related variables (Metin, 2014). In this context, the study analyzed the extent to which biomotor skills and attention-related cognitive variables predict shooting accuracy among athletes.

Participants

In this study, a convenience sampling method was employed. The sample consisted of 22 athletes. The limited access to shooting athletes and the low number of active athletes in this discipline within the province where the study was conducted played a role in determining the sample size. All athletes and coaches were informed about the study protocol and potential experimental risks. For participants under 18, parental consent was obtained, and an informed consent form was signed. The exclusion criteria included ongoing knee, shoulder, hip, and/or lower back pain, cardiovascular or respiratory conditions, and current injuries. Descriptive statistics are presented in Table 1.

Table 1. Descriptive Statistics of the Participants

Variable	$\bar{X}$	SD	Min	Max
Age (years)	19.00	3.54	15	27
Training Experience	3.77	2.20	1	8
Weight (kg)	65.86	8.48	50	89
Height (m)	1.71	0.08	1.58	1.84
BMI (kg/m ²)	22.37	2.25	18.51	27.78

As shown in Table 1, participants' ages ranged from 15 to 27 years, with a mean age of 19.00 ± 3.55 years. The duration of sports participation varied between 1 and 8 years, with a mean training experience of 3.77 ± 2.20 years. Participants' body weights ranged from 50 to 89 kg, with a mean of 65.86 ± 8.49 kg. Heights ranged from 1.58 to 1.84 meters, averaging 1.71 ± 0.08 meters. Body Mass Index (BMI) values ranged from 18.51 to 27.78

kg/m², with a mean BMI of 22.37 ± 2.26 kg/m².

Research Procedure

Participants were instructed not to eat anything for at least two hours before the test and to avoid intense physical exercise for 48 hours prior to testing. Before the measurements, all participants performed a standardized 15-minute general warm-up followed by a 5-minute static stretching protocol. After the warm-up, the performance tests were administered in a randomized order. An approximately 2-minute rest period was provided between each trial to reduce fatigue. The study was conducted in two separate sessions. In the first session, strength and balance tests were performed, while attention and shooting performance tests were administered in the second session. In accordance with standard protocols, participants completed the Flamingo Balance Test barefoot. Tasks requiring hand use (e.g., grip strength, shooting) were performed with the self-reported dominant hand. To minimize the effects of circadian rhythm, all tests were conducted at the same time of day for each participant (between 16:00 and 18:00).

Data Collection Tools

This study used motor skill tests and cognitive assessments as data collection tools. The motor tests included the “Medicine Ball Throw Test,” “Hand Grip Strength Test,” and “Flamingo Balance Test”. For the evaluation of cognitive performance, the Stroop Test was applied. Shooting performance was assessed using the Shooting Accuracy Test.

Personal Information Form

The form included questions about participants’ demographic characteristics such as age, gender, training experience, height, and weight.

Medicine Ball Throw Test (MBTT)

The medicine ball throw test assessed participants’ bilateral upper extremity strength. Participants sat with their backs, shoulders, and heads against the wall, holding a 2 kg medicine ball with their upper arms at a 90° angle and elbows bent. They were asked to throw the ball as far as possible using the chest pass technique. The body and head were kept in contact with the wall, maintaining contact with the wall during the movement. (Borms et al., 2016; Harris et al., 2011; Cronin & Owen, 2004).

Hand Grip Strength Test (HGST)

During the grip strength measurement, participants were seated with their arm positioned close to the body in a neutral rotation, elbow flexed at 90°, forearm in mid-position, and wrist rest. The test was performed first with the dominant hand, followed by the non-dominant hand. Each hand was tested three times with a 60-second rest interval between trials. The average of the three trials was recorded in kilograms separately for the dominant and non-dominant hands (Gąsior, 2018; Pizzigalli et al., 2016).

Flamingo Balance Test

The Flamingo Balance Test is a simple field test to assess individuals’ static balance skills. A wooden platform measuring 50 cm in length, 4 cm in height, and 3 cm in width is used for the test. The participant stands on the platform on one leg and maintains balance without losing stability. The test lasts 1 minute, and the stopwatch runs continuously throughout the test. Loss of balance, use of support, touching the ground with the foot, or falling off the platform is considered a “mistake.” Each mistake is recorded as one point, and the total number of mistakes made within one minute is taken as the test result. Fewer mistakes indicate better balance performance (Deforche et al., 2003).

Cognitive Test (Stroop Test)

The Stroop test was used to assess the attention levels of the participants. This neuropsychological test assesses the ability to simultaneously process congruent and incongruent stimuli, manage information processing, and resist interference from automatic responses (MacLeod, 1991). One of the most important features of the Stroop effect is that it can provide reliable results under different stimulus and response conditions (MacLeod, 1991; Santos & Montgomery, 1962). In the test, participants were asked to say the ink color in which a colored word was printed (e.g., ‘Yellow’ in blue) rather than read the word itself. Delays in response were used to assess attention levels. To measure the Stroop interference, the proportional Stroop effect (PSE) was calculated using the following formula: $100 \times (RT_{\text{incongruent}} - RT_{\text{neutral}}) / RT_{\text{neutral}}$ (Vitkovitch et al., 2002).

Shooting Performance Measurement

A portable 10-meter air rifle and pistol assessed participants' shooting performance. Shot accuracy was recorded via a special software system and an electronic platform that connected the shooting line to the target line. Each participant completed a series of 10 consecutive shots, and their total scores were recorded (Ertürk et al., 2022).

Statistical analysis

The collected data were analyzed, and any missing or incorrect entries were excluded from the evaluation. The normality of the data distribution was assessed using skewness and kurtosis values, and it was confirmed that the data met the assumptions of normal distribution. Subsequently, a multiple regression analysis was conducted to examine the predictive effects of independent variables such as sports experience, Dominant Hand Grip Strength (DHGS), Non-Dominant Hand Grip Strength (NDHGS), Balance, Proportional Stroop Effect (PSE), and Seated Medicine Ball Throw Test on Shooting Accuracy. A stepwise regression method was used to determine which independent variables significantly predicted shooting accuracy. This method identified the variables that significantly contributed to the prediction and calculated the percentage of variance explained by each. The significance level was set at 0.05.

Results

Table 2. Stepwise Regression Analysis Results for Shooting Accuracy

Model	R	R ²	Adjusted R ²	Std. Error of Estimate
1	0.000	0.000	0.000	11.225
2	0.661	0.438	0.409	8.627
3	0.758	0.574	0.530	7.698
4	0.812	0.659	0.602	7.080

As shown in Table 2, Model 1 includes only the constant term and does not explain any variance in the dependent variable ($R^2 = 0.000$). In Model 2, when sports experience is added, the model's explanatory power increases significantly ($R^2 = 0.438$), indicating that this variable alone accounts for 43.8% of the variance in shooting accuracy. In Model 3, including Dominant Hand Grip Strength raises the explained variance to 57.4% ($R^2 = 0.574$). In Model 4, Balance is added, increasing the explained variance to 65.9% ($R^2 = 0.659$), suggesting that sports experience, Dominant Hand Grip Strength, and Balance significantly predict shooting accuracy.

Table 3. Coefficients and Significance Levels in Predicting Shooting Performance

Model	Predictors	B	Std. Error	β	t	p
1	Constant	93.541	2.393	-	39.086	<.001*
2	Constant	80.822	3.712	-	21.771	<.001*
	Sports Experience	3.371	0.855	0.661	3.944	<.001*
3	Constant	63.554	7.729	-	8.223	<.001*
	Sports Experience	2.262	0.885	0.444	2.556	0.019*
	DHGS	0.500	0.202	0.429	2.473	0.023*
4	Constant	70.300	7.793	-	9.021	<.001*
	Sports Experience	2.245	0.814	0.440	2.758	0.013*
	DHGS	0.432	0.189	0.370	2.285	0.035*
	Balance	-1.102	0.521	-0.297	-2.113	0.049*

DHGS: Dominant Hand Grip Strength

*p<.05.

Note: Proportional Stroop Effect (PSE), Non-Dominant Hand Grip Strength, and Medicine Ball Throw Test did not show significant predictive value and were therefore excluded from the model. An examination of Table 3 reveals that sports experience showed a positive and significant effect in all models, with Model 4 indicating a beta value of $\beta = 0.440$. The dominant hand grip strength (DHGS) variable was included starting from Model 3 and demonstrated a significant positive effect ($\beta = 0.370$). When the balance variable was added in Model 4, it showed a significant negative effect ($\beta = -0.297$). Considering that the balance score represents the number of errors made within one minute, lower values indicate fewer errors and better shooting accuracy. In general, sports experience, dominant hand grip strength, and balance were all found to have significant effects on shooting accuracy. Among these, sports experience emerged as the strongest predictor in all stages ($\beta = 0.440$), followed by dominant hand grip strength as the second most influential factor ($\beta = 0.370$), and balance, which positively influenced performance through fewer postural errors. Additionally, the final model did not include the proportional Stroop effect, non-dominant hand grip strength (NDHGS), and the Medicine Ball Throw Test, indicating that these variables did not significantly predict shooting accuracy.

Discussion and Conclusion

Success in shooting sports relies on various physical factors such as balance, proper posture, trigger control, endurance, and effective control of body sway. In particular, experienced shooters have been shown to use more coordinated arm movements to minimize firearm motion within their postural control system (Diler et al., 2022). Furthermore, as shooting is both a physical and a mental sport, an athlete's emotional and psychological state can directly affect their attention and performance (Sağlam & Genç, 2007). The findings of this study indicate that shooting performance is a multidimensional construct significantly influenced by physiological and psychological variables. Sports experience, dominant hand grip strength, and balance ability were found to have significant and positive effects on shooting accuracy. These results are consistent with current studies in the literature.

The study's findings indicated that the experience level significantly and positively affected shooting accuracy. This suggests that as experience increases, individuals tend to achieve more successful shots. Previous research in the literature supports these results. It has been reported that police officers with higher levels of experience demonstrate greater shooting accuracy compared to those with less experience and that this experience enhances the ability to maintain performance under stressful conditions (Hope et al., 2012). Experienced officers were able to sustain their shooting performance

under both low and high arousal levels, which has been attributed to more efficient use of cognitive resources (Landman et al., 2015). These findings align with theoretical perspectives suggesting that during skill acquisition, cognitive load decreases, and performance becomes more automated (Fitts & Posner, 1967). Similarly, a study conducted on soldiers working under high stress revealed that experienced individuals maintained shooting performance despite increased heart rate (Nibbeling et al., 2014). Furthermore, it has been reported that experienced athletes perform better under stress and anxiety, and this is associated with automated skills developed through experience (Cocks et al., 2015). Taken together, these findings are consistent with the results of the present study, supporting the conclusion that experience level is a key determinant of shooting performance.

Another finding of the study showed that dominant hand grip strength had a positive effect on shooting performance. Increased strength in the dominant hand enhanced control over the pistol and rifle, improving shooting accuracy and speed. This result is consistent with findings from a study on tactical athletes, which reported a significant relationship between dominant hand grip strength and shooting performance (Dut et al., 2024). Similarly, athletes with higher grip strength achieved better shooting scores in the study by Peljha et al. (2021). Other studies have also emphasized that dominant hand grip strength is a key variable in shooting performance (Copay & Charles, 2001; Kayihan et al., 2013; Ocak & Balamut, 2022; Simas et al., 2022).

A different study finding indicated that balance ability significantly and positively affected shooting performance. A lower number of errors in the balance test reflected a more stable posture among participants, which contributed to improved shooting accuracy. This finding is supported by previous research. A study on biathlon athletes reported a negative relationship between postural balance and rifle stability, noting that athletes with higher balance ability achieved more successful shots (Sattlecker et al., 2014). Another study suggested that individual differences may influence the relationship between postural balance and shooting performance, with some athletes benefiting from balance proficiency more than others (Mojžiš & Paugschová, 2013). Additionally, balance control has been identified as a critical factor for performance in precision sports such as biathlon and pentathlon (Zemková, 2022). These results are consistent with the findings of the present study. Similar findings have been reported in different sports. For example, a study on elite handball players showed that upper extremity neuromuscular control and grip strength did not predict shooting accuracy. In contrast, sports experience was identified as the key determinant (Asan, 2023). In contrast, research conducted with young soccer players indicated that lower extremity neuromuscular control and stability scores were not significantly associated with biomotor performance (Asan et al., 2025). These results highlight that the influence of motor and cognitive variables on performance may vary depending on the sport, age group, and the specific tests applied.

The last finding of the study revealed that cognitive and strength-based variables, such as the proportional Stroop effect, did not significantly predict shooting accuracy. This contrasts with some studies in the literature that emphasize the role of attentional control in shooting performance. Previous research has shown that elite shooters demonstrate more controlled eye movements during aiming and focus longer on the center of the target (Vickers, 1996; Mann et al., 2011). Moreover, attentional control strategies have been reported to play a key role in maintaining shooting performance under stress (Janelle et al., 2000). The Stroop test assesses not only attention control but also executive functions, cognitive flexibility, and response inhibition (MacLeod, 1991). Therefore, the lack of a significant result may stem from the inability to isolate attention skills under sport-specific conditions. Considering that components like selective

attention may directly impact closed-skill tasks such as shooting, using more targeted instruments like the d2 test of attention is recommended (Brickenkamp & Zilmer, 1998). The non-significant predictive value of the proportional Stroop effect suggests that attention abilities may be more strongly related to performance when evaluated alongside motor control, experience, and balance.

Conclusion

The findings of this study demonstrate that high performance in shooting sports depends on the holistic development of both physical and cognitive skills. It was observed that sports experience, grip strength, and balance skills significantly increased shooting accuracy. In contrast, attention and cognitive control were effective only when considered alongside motor skills. Therefore, it is recommended that training programs be structured to include not only mental but also physical abilities. Although this study examined the effects of biomotor and cognitive variables on shooting performance, certain limitations exist.

Study Limitations and Recommendations

The limited sample size restricts the generalizability of the findings. Additionally, attention level was assessed solely through the Stroop test, which may inadequately represent the multidimensional nature of attention. For this reason, it is suggested that other attention measures, such as the d2, go/no-go, or n-back tests, be incorporated. The study's cross-sectional design also prevents causal inferences between variables, allowing only for interpreting simultaneous relationships. Furthermore, evaluating shooting performance solely based on accuracy scores neglects other important performance dimensions, such as reaction time or proximity to the target center.

Kısaltmalar / Abbreviations

SD	Standart sapma (Standard deviation)
X	Ortalama (Mean)
SPSS	Sosyal bilimler için istatistik paketi (Statistical package for the social sciences)
p value	Anlamlılık değeri (Significant value)
r value	Korelasyon değeri (Correlation value)
N	Katılımcı sayısı (Number of participant)
Min	Minimum (Minimum)
Max	Maksimum (Maximum)
BMI	Vücut kütle indeksi (Body mass index)
Kg	Kilogram (Kilogram)
Cm	Centimeter
Kcal	Kilokalori (Kilocalorie)
W	Wat (Watt)

Beyanlar / Declarations

Etik Onay ve Katılım Onayı / Ethics approval and consent to participate

Bu çalışma Helsinki Bildirgesi'ne uygun olarak yürütülmüştür. Etik onay, Erzurum Teknik Üniversitesi Bilimsel Araştırma ve Yayın Etik Kurulu'ndan alınmıştır (Toplantı No: 10, Karar No: 13, Tarih: 12/09/2024). Tüm katılımcılardan yazılı bilgilendirilmiş onam alınmış, 18 yaşın altındaki bireyler için ebeveyn onayı sağlanmıştır.

This study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Scientific Research and Publication Ethics Committee of Erzurum Technical University (Meeting No. 10, Decision No. 13, Date: 12/09/2024). Written informed consent was obtained from all participants, and parental consent was secured for those under 18.

Veri Ve Materyal Erişilebilirliği / Availability of data and material

Bu çalışmanın bulgularını destekleyen veriler, makul talepler üzerine sorumlu yazardan temin edilebilir. Veri seti yalnızca akademik amaçlar için erişilebilir olacak ve verilerin herhangi bir kullanımı, orijinal çalışmayı referans gösterecek ve katılımcıların gizliliğini koruyacaktır.

The data that support the findings of this study are available from the corresponding author upon reasonable request. The dataset will be accessible only for academic purposes, and any use of the data will recognize the original study and maintain the confidentiality of the participants.

Çıkar Çatışması / Competing interests

Yazarlar, bu makalede sunulan çalışmayı etkileyebilecek herhangi bir çıkar çatışması veya kişisel ilişkiye sahip olmadıklarını beyan etmektedirler.

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Yazar Katkıları / Authors' Contribution Statement

Çalışmanın tasarımı ve planlanması: S.A.; Veri toplama, analizi veya yorumlanması: S.A.; Makalenin yazımı: S.A.; Veri düzenleme, yöntem belirleme, yazım – özgün taslak, yazım – gözden geçirme ve düzenleme: S.A.; Tüm yazarlar, makalenin önemli noktalarını eleştirel bir şekilde gözden geçirmiştir. Tüm yazarlar makalenin son halini onaylamıştır.

Design and planning of the study: S.A.; Data collection, analysis or interpretation: S.A.; Manuscript preparation: S.A.; Data organization, methodology development, writing - original draft, writing – review and editing: S.A.; All authors critically reviewed the key points of the manuscript and approved the final version.

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