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Investigation of the effect of volleyball training on perception and decision-making parameters of 12-14 year old boys

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Abstract

The aim of this study was to investigate the effects of volleyball training on the perception and decision-making skills of 12-14-year-old male children. The participants were divided into two groups: an experimental group and a control group. The experimental group participated in regular volleyball training sessions three times a week for one year, while the control group did not participate in any regular volleyball training. To assess the participants' perception and decision-making parameters, the computer-assisted Psychotechnical ALG system was used, including the Selective Attention Test (SEDT), Visual Perception and Memory Test (GABT), Visual Continuity Test (GST), Judgment Ability Test (MYT), Speed and Distance Test (HMT), Reaction Time Test (RTT), and Environmental View Test (EVT). Statistical analysis of the data was conducted using SPSS 26. The differences between pre- and post-tests were determined using the Paired-Samples t-test. The significance level was set at ($p<0.01$). Significant differences between pre- and post-test scores were found for the experimental group in the Selective Attention Test (SEDT), Visual Perception and Memory Test (GABT) Error Percentage, Visual Continuity Test (GST), Judgment Test (JT), and Environmental View Test (EVT) ($p<0.01$). No significant differences were found between the pre- and post-test scores of the control group in terms of perception and decision-making parameters ($p>0.01$). As a result, regular volleyball training has been shown to improve parameters such as attention, judgment ability, and visual perception in children.

Keywords: Attention, decision making, perception, training, volleyball

Voleybol antrenmanlarının 12-14 yaş erkek çocukların algı ve karar verme parametrelerine etkisinin incelenmesi

Öz

Çalışmada voleybol antrenmanlarının 12-14 yaş erkek çocuklarının algı ve karar verme becerilerine etkisinin incelenmesi amaçlandı. Katılımcılar deney ve kontrol grubu olarak 2'ye ayrıldı. Deney grubu 1 yıl haftada 3 gün düzenli voleybol antrenmanlarına katıldılar. Kontrol grubu ise 1 yıl düzenli herhangi bir voleybol antrenmanına dahil edilmediler. Katılımcıların algı ve karar verme parametrelerini değerlendirmek için bilgisayar destekli Psikoteknik ALG sisteminde Seçici Dikkat Testi (SEDT), Görsel algı ve bellek testi (GABT), Görsel Süreklilik Testi (GST), Muhakeme yeteneği testi (MYT), Hız ve mesafe testi (HMT), Tepki hızı Testi (THT), Çevresel Görüş Testi (ÇGT) uygulandı. Verilerin istatistiksel analizinde SPSS 26. paket programı kullanıldı. Ön ve son test arasındaki farklılıkların belirlenmesinde bağımlı gruplar t-test kullanıldı. Anlamlılık düzeyi ($p<0,01$) olarak belirlendi. Deney grubunun Seçici Dikkat Testi (SEDT), Görsel algı ve Bellek testi (GABT) Yanlış Yüzde, Görsel Süreklilik Testi (GST), Muhakeme Testi (MT) ve Çevresel Görüş Testi ÇGT) ön test ve son test değerleri arasında istatistiksel olarak anlamlı farklılık tespit edildi ($p<0,01$). Kontrol grubunda ise algı ve karar verme ön test ve son test değerleri arasında istatistiksel olarak anlamlı farklılık tespit edilmedi ($p>0,01$). Sonuç olarak; düzenli voleybol antrenmanlarının çocuklarda algı ve karar verme parametrelerinden dikkat, muhakeme yeteneği, görsel algı gibi parametrelerde iyileşmeler sağladığını göstermektedir.

Anahtar Kelimeler: *Algı, antrenman, dikkat, karar verme, voleybol*

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INTRODUCTION

Perceptions, especially in terms of stimuli, it is important to be able to act a little earlier than our competitors in sports in order to be successful. For this, athletes need to have a high level of perception. Perception means being aware of the environment around us, which gives us the ability to respond quickly and accurately to the developing situation in sporting activities. Accelerating and optimizing perception is possible through training. The increase of perception speed in athletes develops especially through elements such as sudden changes of speed, changes of direction and caromboles (Sayın, 2011). Perception is especially important in open skill disciplines. Open skill can be defined as the athlete's ability to make a quick decision and react to random external stimuli in an unpredictable environment (Farrow, 2005; Schmidt & Craig 2008). Training level, ability, cognitive processes are effective at different levels in performing skills (Karakaş, 2018; Sancı, 2022; Arslan Kabasakal et al., 2023; Elitok, 2023; Arslan Kabasakal, 2024). Perception plays a critical role especially in open skill disciplines. In this context, the athlete's ability to perceive environmental stimuli and react accordingly is of great importance in sports such as volleyball, which require dynamic and rapid decision-making. Volleyball, as a sport that develops such perceptual and cognitive abilities, constantly tests players' attention, strategising and decision-making skills (Büyükipekçi & Taşkın, 2011). In volleyball, which is a technical game, besides motoric characteristics, players' skills such as perceiving the environment, sensing the speed and distance of the ball, and moving with the right timing are of great importance (Gündüz, 1997).

Volleyball is a sport in which technical, tactical, conditioning and mental abilities interact in a complementary way and these elements form the basis of performance. Volleyball competitions can create high levels of emotional and mental stress on players. In order to be successful in such competitions, athletes need to be able to make quick and correct decisions, control their emotions, and play an error-free game under challenging conditions (Çelenk, 2013). The decisions made in volleyball games can directly affect the course of the match or the score. Critical situations, moments under pressure, changes in the last minutes and tactical changes play a big role in the decision-making process of athletes (Kelecek, 2013). Decisions made correctly and appropriately affect the game in a positive way; however, wrong decisions or decisions made at the wrong time not only affect the player negatively, but can also change the outcome of the game (Leveaux, 2010). Therefore, the factors that make up perception and decision-making mechanisms need to be examined and improved. It is emphasized that cognitive processes such as perception, intuition and decision-

making should be guided in a holistic manner in addition to fitness skills in order to perform game actions at a conscious level in volleyball.

When the literature is analysed, perception and decision making in volleyball are critical factors that directly affect the performance of players in the game. The development of these skills constitutes an important development area especially for athletes in childhood. This study aims to contribute to this field by investigating the perception and decision-making processes of 12-14 year old boys in volleyball and how training methods can be adapted to improve these skills.

METHOD

Research model

The study examined the effect of volleyball training on the perception and decision-making skills of boys aged 12-14 years. The experimental design of the study was based on a pretest-posttest model with experimental and control groups.

Research group

The participants were divided into 2 groups as experimental and control group. The mean age, body weight and height of the experimental and control groups are given in Table 1. The experimental group consisted of 13 volunteers who were selected among the children who had not participated in volleyball training before and who regularly participated in volleyball training of GAP sports club 3 days a week for 1 year, and the control group consisted of 14 volunteers who were selected among the children who had not participated in volleyball training before and who did not receive any regular volleyball training for 1 year, totaling 27 male students. In determining the sample group, the participants were selected by random selection method. The experimental group was trained with basic volleyball techniques, finger pass, cuff, serve, block and defence techniques in volleyball training programme 3 days a week for 12 months. The control group did not receive any regular volleyball training and continued their normal daily activities. The participants were administered a pre-test before starting 12 months of regular volleyball training and a post-test after completing 12 months of regular volleyball training programme. selective attention test (SEDT), visual perception and memory test (VPMT), visual continuity test (VCT), reasoning ability test (CRT), speed and distance test (HMT), speed of reaction test (RTT), peripheral vision test (PERT) were applied with Psychotechnical ALG Test System to evaluate the perception and decision-making skills of the participants before and after the study and the scores were recorded on the computer-aided system.

Table 1. Pretest and posttest averages of age, height and body weight of experimental and control groups

Variables	Measurements	Experimental Group (n=14) X̄/Sd	Control Group (n=13) X̄/Sd
Age (years)	Pre-Test	12,53±1,05	13,21±0,57
	Pre-Test	13,53±1,16	14,21±0,75
Height (cm)	Post-Test	163,69±7,68	150,64±5,75
	Pre-Test	171,69±7,36	158,78±7,50
Body weight (kg)	Post-Test	53,07±6,71	40,21±8,29
	Pre-Test	60,53±7,30	48,85±7,57

Data collection tools

Licensed assessment system software developed by Psychotechnical ALG (https://www.algpsikoteknik.com) was used to evaluate the perception and decision-making skills of the participants before and after the study. selective attention test (SEDT), visual perception and memory test (VPMT), visual continuity test (VCT), reasoning ability test (CRT), speed and distance test (HMT), Speed of Reaction Test (RTT), peripheral vision test (PERT) were applied and the scores were recorded on the computer-aided system. The test was performed in a standardised isolated test room prepared to obtain objective data in accordance with international norms without being affected by environmental factors (İşsever et al. 2021).

Selective attention test (SAT)

In this test, the level of selective attention is measured by asking participants to distinguish certain stimuli from complex stimuli. Attention is directed to the perception process among the various stimuli that make up the content of the test, only on those that are determined as critical stimuli within the scope of the test, and these critical stimuli, which come frequently and continuously, are asked to be recognized and decided by selective perception.

Visual perception and memory test (VPMT)

It is a test that measures visual perceptual performance and perceptual speed after being shown photo-related images for short periods of time (1 second).

Visual continuity test (VCT)

In an environment with complex images, attention is asked to be directed in a controlled manner in a certain direction. This test is a test that takes into account visual continuity in shape perception, the ability to continuously follow the criteria that enable selective behavior in shape perception, and the speed of the responses given in this context.

Reasoning ability test (RAT)

This test is based on comprehending and recognizing the relationships between abstract visual shapes and includes multiple-choice questions. The questions are arranged from easy to difficult. It is a test based on the ability to understand and evaluate, the use of analytical thinking skills, the process of drawing meaningful conclusions from clues about phenomena and understanding the principles that provide the relationships between phenomena. The participant is first asked about the logical relationship between two pictures and asked to find the correct one among the options.

Speed and distance test (SDT)

This test measures a person's ability to estimate the speed of movement of moving objects and their distance to the target.

Peripheral vision test (PVT)

Examined when stimuli presented at an angle between 120 and 140 degrees entered the participants' field of view. This test was based on the participant's ability to recognize and react to stimuli coming from the left and right while focusing attention on a task in front.

Speed of reaction test (SRT)

In this test, the participants correct responses to visual stimuli of different colors and auditory stimuli of different tones, and the speed of these responses were measured. It measured how fast and how accurately the participants could react in a sudden and panic situation.

Ethical approval and participant disclosure

The ethical appropriateness of the study was approved by Harran University Health Sciences Ethics Committee with decision number 22.02.21/2. The study was also conducted in accordance with the principles of the Declaration of Helsinki. All participants in this study were informed about the purpose and content of the study. Written informed consent was obtained from their families and children's consent for voluntary participation was obtained. In this way, it was ensured that the participants developed full awareness of the study process and were informed about possible risks. This research was supported by Harran University Scientific Research Projects (BAP) unit within the scope of the project dated 12.12.2022 and numbered 22265.

Data analysis

SPSS 26 (Statistical package for social sciences) package programme was used for statistical analysis of the data. Paired-Samples t-test was used to determine the differences between pre and post-test data within and between groups. Cohen'd method was used to calculate the effect size of the data. The significance between the differences was determined at (p<0,01) level.

FINDINGS

In this study, pre-test and post-test values of perception and decision-making skills of the experimental and control groups were analyzed. selective attention test (SAT), visual perception and memory test (VPMT), visual continuity test (VCT), reasoning ability test (RAT), speed and distance test (SDT), peripheral vision test (PVT), speed of reaction test (SRT) were measured before and one year after the volleyball training of the experimental group. The comparison of pre-test and post-test data is presented in Table 2.

Table 2. Pre-test and post-test comparison of perception and decision-making parameters in the experimental group

Variables	Measurements	$\bar{X}$/Sd (n=13)	p	Cohen's d
Selective Attention Test (SAT) (%)	Pre-Test	59.00±11.66	0.000*	1.23
	Post-Test	75.30±13.63		
Visual Perception and Memory Test Correct (VPMT) (%)	Pre-Test	63.92±11.35	0.64	
	Post-Test	65.07±8.52		
Perception and Memory Test Incorrect (VPMT) (%)	Pre-Test	41.15±9.89	0.010*	0.690
	Post-Test	30.15±8.22		
Visual Continuity Test (VCT) (%)	Pre-Test	56.76±21.19	0.006*	0.870
	Post-Test	73.30±19.13		
Reasoning Ability Test (RAT) (points)	Pre-Test	15.38±3.17	0.000*	0.780
	Post-Test	21.61±2.46		
Speed and Distance Test (SDT) (points)	Pre-Test	50.76±10.91	0.347	
	Post-Test	54.15±10.85		
Peripheral Vision Test (PVT) (%)	Pre-Test	84.76±16.29	0.011*	1.13
	Post-Test	97.07±3.20		
Speed of Reaction Test (SRT) (ms)	Pre-Test	730.15±115.07	0.529	
	Post-Test	754.84±137.52		

*p<0.01; **SAT:** Selective Attention Test, **VPMT:** Visual Perception and Memory Test, **VCT:** Visual Continuity Test, **RAT:** Reasoning Ability Test, **SDT:** Speed and Distance Test, **PVT:** Peripheral Vision Test, **SRT:** Speed of Reaction Test

When Table 2 is analysed, a highly significant difference was found between the pre-test and post-test values of selective attention test (SEDT), visual perception and memory test (VPMT) false percentage, visual continuity test (VCT), reasoning test (MT) and peripheral vision test (PVT) of the experimental group (p<0.01). There was no statistically significant

difference between the pre-test and post-test values of the visual perception and memory test (VPMT) correct percentage, speed and distance test (SDT) and speed of reaction test (SRT) (p>0.01).

Table 3. Pre-test and post-test comparison of perception and decision making parameters in the control group

Variables	Measurements	X̄/Sd (n=14)	p
Selective Attention Test (SAT) (%)	Pre-Test	71.64±13.84	0.640
	Post-Test	74.42±20.32	
Visual Perception and Memory Test Correct (VPMT) (%)	Pre-Test	71.78±10.03	0.800
	Post-Test	70.92±8.38	
Perception and Memory Test Incorrect (VPMT) (%)	Pre-Test	35.85±10.81	0,070
	Post-Test	31.07±8.85	
Visual Continuity Test (VCT) (%)	Pre-Test	88.28±5.75	0.158
	Post-Test	84.00±12.84	
Reasoning Ability Test (RAT) (points)	Pre-Test	21.28±2.67	0.121
	Post-Test	19.21±4.28	
Speed and Distance Test (SDT) (points)	Pre-Test	57.14±12.47	0.561
	Post-Test	59.35±13.06	
Peripheral Vision Test (PVT) (%)	Pre-Test	95.28±5.15	0.170
	Post-Test	90.14±13.00	
Speed of Reaction Test (SRT) (ms)	Pre-Test	675.07±87.55	0.223
	Post-Test	641.78±111.46	

*p<0.01; **SAT:** Selective Attention Test, **VPMT:** Visual Perception and Memory Test, **VCT:** Visual Continuity Test, **RAT:** Reasoning Ability Test, **SDT:** Speed and Distance Test, **PVT:** Peripheral Vision Test, **SRT:** Speed of Reaction Test

When Table 3 is examined, no statistically significant difference (p>0,01) was found between the pre-test and post-test values of selective attention test (SAT), visual perception and memory test (VPMT) false percentage, visual perception and memory test (VPMT) correct percentage, visual continuity test (VCT), reasoning ability test (RAT), speed and distance Test (SDT), peripheral vision test (PVT) and speed of reaction test (SRT) of the control group.

Table 4. Pre-test and post-test comparison of perception and decision making parameters of experimental and control groups

Variables	Measurements	X̄/Sd	p	Cohen's d
Selective Attention Test (SAT) (%)	Control Group (n=14)	2.78±21.76	0.058*	0.78
	Experimental Group (n=13)	16.30±12.25		
Visual Perception and Memory Test Correct (VPMT) (%)	Control Group (n=14)	-0.85±12.40	0.628	
	Experimental Group (n=13)	1.15±8.68		
Perception and Memory Test Incorrect (VPMT) (%)	Control Group (n=14)	-4.78±9.05	0.166	
	Experimental Group (n=13)	-11.00±12.95		

Variables	Measurements	X̄/Sd	p	Cohen's d
Visual Continuity Test (VCT) (%)	Control Group (n=14)	-4.28±10.69	0.001*	0.810
	Experimental Group (n=13)	16.53±17.93		
Reasoning Ability Test (RAT) (points)	Control Group (n=14)	-2.07±4.66	0.000*	0.220
	Experimental Group (n=13)	6.23±3.81		
Speed and Distance Test (SDT) (points)	Control Group (n=14)	2.21±13.88	0.820	
	Experimental Group (n=13)	3.38±12.46		
Peripheral Vision Test (PVT) (%)	Control Group (n=14)	-5.14±13.24	0.003*	0.500
	Experimental Group (n=13)	12.30±14.75		
Speed of Reaction Test (SRT) (ms)	Control Group (n=14)	-33.28±97.35	0.215	
	Experimental Group **(n=13)**	24.69±137.36		

In Table 4, in the pre-test and post-test comparisons of the perception and decision-making parameters of the experimental and control groups, a statistically significant difference was observed between selective attention test (SAT) and visual continuity test (VCT) at high level, reasoning ability test (RAT) at low level and peripheral vision test (PVT) at medium level ($p<0.01$), visual perception and memory test (VPMT) false percentage, visual perception and memory test (VPMT) correct percentage, speed distance test (SDT), and speed of reaction test (SRT) showed no statistically significant difference ($p>0.01$).

DISCUSSION AND CONCLUSION

As a result of the data obtained in this study, which aimed to examine the effect of volleyball training on the perception and decision-making parameters of 12-14 years old boys, a statistically significant difference was found between the pre-test and post-test comparison of the experimental group, which continued regular volleyball training for 1 year, between the values of attention, visual perception correct percentage, visual continuity, judgement and peripheral vision among the perception and decision-making parameters ($p<0.01$). There was no statistically significant difference between visual perception false percentage, speed and distance estimation and reaction speed values ($p>0.01$). In the control group who did not participate in any regular volleyball training, no statistically significant difference was found between the pre-test and post-test values of perception and decision-making parameters ($p<0.01$). When the pre-test and post-test differences of perception and decision-making parameters of the experimental and control groups were compared, statistically significant differences were found in selective attention, visual continuity, reasoning ability and peripheral vision values ($p<0.01$).

When the literature is examined, there are studies showing that games and physical activities applied to children can improve attention (Yurdakul et al., 2012; Göktepe et al., 2016; Kartal et al., 2016; Renk et al., 2020). In Adsız's (2010) study investigating the effect of regular sports on attention of primary school students, it was determined by the tests that those who do sports are 83% more careful than those who do not do sports. Çağlar and Koruç (2006) found no significant difference between genders in the validity and reliability study of the d2 test evaluating attention for athletes, while a difference was found between the years of education of the participants. Asan (2011) conducted a study to examine the attention levels of children doing table tennis exercises and observed that table tennis exercises had a positive effect on the attention characteristics of children aged 9-13 years. Sürek (2021) examined the perceptual motor skills and attention characteristics of team and individual sports students and found a significant difference in attention skill and reaction test subheadings according to the gender of students in volleyball and handball sports. Lola et al. (2022), in their study on the effect of different attention focusing instructions on the skill learning of volleyball beginners, concluded that the outward focusing method is suitable for improving both the form and outcome of perceptual-motor skills. İbiş et al. (2021) found no significant relationship between physical activity level and attention level in a study on the examination of physical activity level, motor skills and attention levels in children, while a significant relationship was found between motor skills and attention level parameters. Kurt and İnce (2022) examined the relationship between selective attention and technical skill performances in male football players and found a low level significant relationship between selective attention, technical skills with and without ball. In our study, a statistically significant difference was found in the attention parameter of the volleyball training experimental group when the pre-test and post-test were compared ($p<0.01$). There was no statistically significant difference in the attention parameter of the control group when the pre-test and post-test were compared ($p>0.01$). When the pre-test and post-test differences of the experimental and control groups were compared, a significant difference was found in favour of the experimental group ($p<0.01$). This result in our study was in parallel with the literature.

Ciucmanski and Watroba (2005) found that peripheral vision and depth perception in football players with 12 years of experience had better results than non-athletes. Kohmura and Yoshigi (2004) gave four-week training using perceptual training methods (computer programme) in college male baseball players and found a significant difference in the visual field of the players at the end of the training. Aktaş (2015) examined the effect of perception

and decision-making mechanisms on agility performances in elite female volleyball players and found that there was a relationship between dual processing skill and visual field of vision values of reactive agility. In our study, no statistically significant difference was found in the pre-test and post-test comparison of peripheral vision values of the experimental group ($p<0.01$). No statistically significant difference was found when the pre-test and post-test of the peripheral vision values of the control group were compared ($p>0.01$). In the comparison of the pre-test and post-test differences of the environmental opinion values of the experimental and control groups, a significant difference was found in favour of the experimental group ($p<0.01$). When the studies on environmental vision parameters were examined, our study showed the same parallelism with the literature.

Zwierko et al. (2010) used the Vienna test system in male 1st league volleyball players (n=12) and non-athletes and found reaction time as 592.11±39.38 (ms) in volleyball players and 648.61±75.14 (ms) in non-athletes. Piras et al. (2014) recorded the reaction time of 15 experienced volleyball players and 15 inexperienced volleyball players as 351 (ms) and 406 (ms), respectively, and found statistical significance between reaction time in experienced and inexperienced volleyball players in favour of experienced volleyball players. Özsaydı et al. (2015), examined the norms of arm and hand coordination, reaction speed, visual motor control, arm speed and hand dexterity in a study in which they examined the motor development of children who did not do sports with an average age of 8.8 years and children in basketball infrastructure and found no significant difference in these skills in basketball playing children according to gender. In current study, no statistically significant difference was found between the speed and distance estimation and reaction speed values of the experimental group in the pre-test and post-test comparison ($p>0.01$). There was no statistically significant difference between the speed and distance estimation and reaction speed values of the control group ($p>0.01$). There was no statistically significant difference between the speed and distance estimation and reaction speed values of the experimental and control groups ($p>0.01$). While this result in our study was similar to some studies in the literature, it also differed with some studies. While this result in our study is similar to some studies in the literature, Bhabhor et al. (2013) and Deepa and Sirdesai (2016), who compared table tennis players and sedentaries, found that the mean reaction time parameters of table tennis players were faster than sedentaries. Aktaş (2015) found a statistically significant relationship between agility and speed distance estimation values of female volleyball players. In the literature, while there are studies showing that athletes have better reaction parameters

than sedentary people, there are also studies in the opposite direction. Lesiakowski et al. (2013) used the Vienna test in boxers and non-athletes and found that the reaction time of boxers was 0.85 (ms) and that of non-athletes was 0.78 (ms), a result in favour of athletes. Aktop et al. (2017), in the study in which they evaluated hand-eye coordination and reaction speed, stated that licensed football players aged 10-12 years completed the test in a longer time than unlicensed football players. Egesoy et al. (1999) evaluated the decision-making performance of elite and non-elite football players and found no statistically significant difference between the decision speeds of the two groups. These results in current study differ from the literature.

As a result, it was observed that playing volleyball regularly 3 days a week for 1 year had a significant effect on attention, visual perception, visual continuity, reasoning and peripheral vision among the perception and decision-making parameters of boys aged 12-14 years. In addition, it was observed that the selective attention, visual continuity, reasoning ability and peripheral vision values of children who played sports regularly improved in favour of those who did not. This result can be said that regular and planned sports, especially in team sports, support cognitive development in children and such activities have an effect on perceptual and decision-making skills. It is thought that children doing sports in addition to their academic life will contribute to their cognitive development.

Recommendations

According to the results of our study, families and teachers should support children's participation in regular sports activities in order to contribute to their skills such as attention, visual perception, visual continuity, selective attention, and reasoning ability.

This study showed the positive effects of volleyball on perception and decision-making skills. It would be useful for future studies to compare the effects of different sports branches on children's cognitive development and provide more extensive data.

In our study, no significant difference was found in distance estimation and reaction time parameters of children who practised volleyball. In order to improve these characteristics, it is recommended to include reaction exercises in addition to the basic technical skills of sports in future studies and training contents.

Strengths of the research

The 12-14 years old boys of the study group are an important period in terms of motor skills and cognitive development. analysing the perception and decision-making skills of this

age group will provide important information about the development of children. In addition, the fact that the study was conducted over a long period of time such as 1 year allows a better understanding of the effects of volleyball training over time. This provides more effective results compared to short-term studies.

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Tasarım *Design*	Yöntem ve araştırma desenini tasarlamak *To design the method and research design.*	Yakup AKTAŞ
Literatür Tarama *Literature Review*	Çalışma için gerekli literatürü taramak *Review the literature required for the study*	Yakup AKTAŞ Ruken YILMAZ
Veri Toplama ve İşleme *Data Collecting and Processing*	Verileri toplamak, düzenlemek ve raporlaştırmak *Collecting, organizing and reporting data*	Yakup AKTAŞ Ruken YILMAZ
Tartışma ve Yorum *Discussion and Commentary*	Elde edilen bulguların değerlendirilmesi *Evaluation of the obtained finding*	Yakup AKTAŞ Ruken YILMAZ

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