

**5-YEAR RETROSPECTIVE ANALYSIS OF AMBULANCE  
DRIVING TECHNIQUES TRAINING FOR PARAMEDIC  
STUDENTS**

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**ABSTRACT**

**Objective:** The major aim of paramedic training is to provide quality patient care. However, the frequency of ambulance accidents constantly increases and constitutes one of the main occupational risks in our country and the world. The study aims to retrospectively evaluate the effectiveness of ambulance driving techniques training given to paramedic students.

**Materials and Methods:** The sample consists of 178 paramedic students participating in an ambulance driving techniques training between 2015 and 2019 and responded to the questionnaire. The students were given a 4-day training, including safe ambulance driving knowledge and practice, and the data were collected using a questionnaire form applied before and after the training. Frequency, mean, Mann Whitney U test, Kruskal Wallis Variance Analysis, Wilcoxon t-test, McNemar chi-square analysis was used in the statistical evaluation of the data, and Spearman correlation analysis was performed to analyze the relationships between variables.

**Results:** The study revealed that 34.8% of the students had increased self-confidence in ambulance driving, the stress caused by ambulance driving decreased in 27% of them, and the students' knowledge levels of traffic rules increased by 31% after the training. While the ratio of students who were aware of their deficiencies about traffic rules was 1.6% before training, it increased up to 12.9% after training, thus students were given the opportunity to realize their lack of knowledge in ambulance driving.

**Conclusion:** The ambulance driving techniques training and similar driving experience positively contribute to the students' knowledge and practice, and this type of training needs to be widespread.

**Keywords:** Ambulance Accident, Occupational Risk, Paramedic, Stress.

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## PARAMEDİK ÖĞRENCİLERİ İÇİN DÜZENLENEN AMBULANS SÜRÜŞ TEKNİKLERİ EĞİTİMLERİNİN 5 YILLIK RETROSPEKTİF ANALİZİ

### ÖZ

**Amaç:** Paramedik eğitiminde asıl odaklanılan konu hasta bakım kalitesidir. Oysa ambulans kazalarının yaygınlığı artarak ülkemizde ve dünyada önemli mesleki risklerden birini oluşturmaktadır. Paramedik öğrencileri için düzenlenen ambulans sürüş teknikleri eğitimi sonrasında, yapılan eğitimlerin etkinliğinin retrospektif olarak değerlendirilmesidir.

**Gereç ve Yöntem:** Araştırma örneklemini, 2015-2019 yılları arasında ambulans sürüş teknikleri eğitimine katılan ve anket sorularını cevaplayan 178 paramedik öğrencisi oluşturmaktadır. Öğrencilere 4 günlük güvenli ambulans sürüş bilgilerini ve pratiğini içeren eğitim verilmiş ve veriler eğitim öncesi ve sonrası uygulanan anket formu ile toplanmıştır. Verilerin istatistiksel değerlendirmesinde frekans, ortalama, Mann Whitney U Testi, Kruskal Wallis Varyans Analizi, Wilcoxon t testi, McNemar ki-kare analizi ve değişkenler arasındaki ilişkilerin analizinde Spearman korelasyon analizleri kullanılmıştır.

**Bulgular:** Ambulans sürüş teknikleri eğitimi sonrasında, öğrencilerin %34.8'inde ambulans sürüşü konusunda kendilerine güvenlerinin arttığı, ambulans sürmenin kendilerinde yarattığı stresin ise öğrencilerin %27'sinde azaldığı belirlenmiştir. Ambulans sürüş teknikleri eğitimi sonrasında öğrencilerin trafik kuralları bilgi düzeyinde %31'lik artış meydana gelmiştir. Trafik kuralları konusundaki eksikliklerini bilen öğrenci sayısı ambulans sürüş teknikleri eğitimi öncesinde %1,6 iken bu yaygınlık ambulans sürüş teknikleri eğitimi sonrasında %12,9'a yükselmiş; öğrencilere ambulans sürüşü konusunda eksikliklerini fark etme imkânı tanınmıştır.

**Sonuç:** Ambulans sürüş teknikleri eğitimi ve benzer nitelikteki, ambulans sürüş deneyiminin öğrencilerin bilgi ve pratiklerine olumlu katkıları olduğu ve bu tür eğitimlerin yaygınlaştırılmasına gereksinim duyulduğu görülmektedir.

**Anahtar Kelimeler:** Ambulans Kazası, Mesleki risk, Paramedik, Stres.

### INTRODUCTION

Performing timely appropriate intervention to the patient is of utmost importance for paramedics and the primarily responsible personnel for pre-hospital treatment. Literature reports that 10-35% of deaths after the accident occur within the first five minutes, and more than 50% occur within the first 30 minutes (Mert Boğa et al. 2018:93; Özyürek et al. 2013:183; Rızalar and Öztürk, 2015:132; Aytaç et al. 2016:55; Altındış et al. 2017:126). The length of time for the arrival of an ambulance to the site is targeted at 10 minutes or less in 80% of the cases in the metropolitan areas and 16 minutes or less in rural areas. American Heart Association (AHA) and European Resuscitation Council (ECR) recommend the initiation of advanced cardiac life

support practices as soon as possible in cardiac arrests, and AHA highlights that the ambulance is supposed to arrive at the hospital from the site of a medical emergency in 8 minutes for these cases (Hunyadi-Antičević et al., 2016:310; Wik et al., 2003:1390; Travers et al., 2015:58; Henderson and Mason, 2004:80; Yılmaz Karakuş et al. 2014:38; Mert Boğa et al. 2018:95). Evidence shows that there is a relationship between early intervention to the trauma patient and patient mortality, and early intervention decreases the mortality rate (ATLS, 2018:40-48; Byrne et al., 2019:290; Harmsen et al., 2015:605-606; Kidher et al., 2012:1390-92; Brown et al., 2016:98). Besides, due to the reaction of the patient's relatives, responding time standards, professional ethics, paramedics feel obliged to act quickly to make the first intervention to the patient and to transport him/her to the hospital after they receive the emergency call. In recent years, traffic accidents have elevated the occupational risks of paramedics due to time pressure, population growth, and uncertainty of traffic rules, etc. (Yenal and Ergör, 2013:33-35; Arsal Yıldırım and Gerdan, 2017:38-40; Ekşi et al., 2015:128-130).

Ambulance-related traffic accidents are reported to be one of the major causes of occupational deaths for pre-hospital emergency health service providers, which constitute 8% of non-fatal injuries (NIOSH, 2019; Reichard, 2017:420-425; Maguire, 2013:377). In a study conducted by Chiu et al. (2017), 1844 injured patients and 8 deaths were reported in 715 ambulance accidents in Taiwan between 2011 and 2016. Gülen et al. (2016) determined that 72% of pre-hospital emergency health service providers in Turkey had at least one motor vehicle accident during working hours. In another study by Gülen et al. (2016), this prevalence was found to be 81.4%. The ambulance accidents are mainly caused by problems related to drivers ambulances, traffic, pedestrians, roads, and management (Smith, 2015:91; Koski and Sumanen, 2019:45-48; WHO, 2004). It is emphasized that young and inexperienced drivers are less able to see potential risks on the road and apply safe driving techniques depending on the road conditions (Russo et al., 2014:25; Al Reesi et al., 2016:480; Farah, 2011:30; Borowsky et al., 2009:1245; Ventisislavova et al., 2016:45).

Until 2012 in Turkey, those employed in ambulances were chauffeurs; however, since the year 2012 and emergency medical technicians (EMT) or paramedics have also been allowed to drive in the ambulance with the latest amendments (RG, 2012). Since paramedics focus on patient care, they are not professional drivers (Koski and Sumanen, 2019:45-47). Therefore, these regulations make it compulsory to add the “Ambulance Driving Techniques” course to the curriculum in universities giving paramedic training and to carry out various studies for paramedic candidates to gain ambulance driving experience for occupational health and safety. Accordingly, this study was conducted to evaluate the effects and contribution level of the

TDTA course given to paramedic students studying at a public university in terms of theoretical, practical, and self-confidence aspects.

## **1.MATERIALS AND METHODS**

### **Research Type**

It is a retrospective analysis of pretest-posttests performed in the last 5 years.

### **Universe and Sampling**

218 paramedic students participated in the TDTA course between 2013 and 2019, and the research sample included 178 of them who responded to the questionnaire.

### **Ethical Principles of the Research**

To carry out the study, retrospective study permission was granted by the Ethics Committee of Non-Interventional Clinical Research of the relevant university. Besides, the researchers informed the participants about the purpose and volunteerism of the study and that filling in the questionnaire forms would mean agreeing to take part in the study.

### **Data Collection**

#### **The TDTA Training**

To reduce the risks of ambulance accidents, increase students' experiences in ambulance driving, and create motivation, a public university has been organizing a 4-day theoretical and practice training provided by the TDTA trainers in ambulance driving techniques lesson for the second-grade students in the Paramedic Program since 2013. The training content was created by adapting the professional TDTA training to the curriculum.

The TDTA trainers included specialists training EMTs, paramedics, and ambulance drivers employed in the Ministry of Health. To perform the training, cooperation was made with the provincial directorate of health, support was provided by professional organizations and the professional TDTA team, responsible for the education of the region where the province is located. After providing occupational accident and disease insurance, all students who had a B class license were included in the training. During the training, one instructor and one ambulance were allocated to six students. The training area was an empty area, which was closed to traffic, 100mx100m in size, a T-street, having an ambulance parking lot, having slalom areas determined by cones, prepared for wetting the slip pad (Photo1), having the area usage permit taken beforehand, and having borders determined by lanes. The stages were

prepared by a professional team in line with the TDTA standards, and students were given practical training between 08:30 am and 05:30 pm under daylight, in April and May to pass the stages. On the first day of the four-day training, theoretical training, vehicle mechanics, driving preparations, vehicle safety systems, acceleration problems in ambulances, vehicle control, right of way, curves, overtaking rules, special situations in traffic, and ambulance accidents were taught. On the 2nd day, practical training, including T-street, daily maintenance, parallel parking, battery reinforcement applications, was applied, and on the 3rd day the participants were trained on accelerating with the siren on, panic and controlled braking, spare tire changing, snow chain installation, and advanced slalom applications. After all the applications were carried out in the form of demonstrations, students were given instant debriefing. On the last day of training, slipping control and practical exam were performed (Table1). The practical exam held by the TDTA trainers was graded on the pre-set control charts, and students who got less than 80 points out of 100 were considered unsuccessful.

**Table 1: TDTA content and methods**

Contents	First and second session (2013 and 2014)	Third session and beyond (2015 and beyond)
TDTA planned	Planned	
Tests prepared	Not Prepared	Prepared
Pre-test	Not applied	Applied
TDTA 1st day	<b>Theoretical training:</b> vehicle mechanics, driving preparations, vehicle safety systems, acceleration problems in ambulances, vehicle control, right of way, curves, overtaking rules, special situations in traffic, and ambulance accidents were taught. <b>Methods</b> - PowerPoint presentation - Question-answer - Video presentation - Discussion - Debriefing	
TDTA 2nd day	<b>Practical training:</b> T-street, daily maintenance, parallel parking, battery reinforcement <b>Methods</b> - Demonstration - Debriefing	
TDTA 3rd day	<b>Practical training:</b> Accelerating with the siren on, panic and controlled braking, spare tire changing, snow chain installation, and advanced slalom applications <b>Methods</b> - Demonstration - Role-playing technique - Debriefing	
TDTA 4th day	<b>Practical training:</b> Slipping control and practical exam <b>Methods</b> - Demonstration	
Post-test	Not applied	Applied



**Photo 1. TDTA Photos a) Preparation of slip pad b) Battery reinforcement c) T Street d) Snow chain installation.**

## *Evaluation of the TDTA*

The questionnaire forms consisting of 30 questions were developed by reviewing the relevant literature and administrated in the pre-and post-training period. The questionnaires aimed to investigate the levels of participants' desire, self-confidence, anxiety, stress, and knowledge about traffic rules and provided them the opportunity to evaluate the training and trainers.

In consultation with the TDTA trainers, the form, including 10 questions, was developed by reviewing the questions used to measure the theoretical knowledge levels of the participants in the TDTA training and the resource book utilized in the training (Ministry of Health-Parder, 2008).

No scale was used in the questionnaire in which the emotional parameters of self-confidence, stress, willingness was measured. For each emotional parameter, 3 questions were prepared in a 3-point Likert form (yes/no/undecided), and experts were consulted, and necessary revisions were made.

The principle causes of ambulance accidents were investigated by reviewing the sourcebook and relevant literature utilized in training to determine the state of anxiety, and 5 questions were prepared in a 3-Likert form (yes/no/undecided), and a consultation was conducted with the TDTA trainers about the questions, and it was finalized.

## Data Analysis

IBM SPSS 20,0 (IBM Corp., Armonk, NY, USA) package program was used to analyze the data. The conformity of the data to the normal distribution was evaluated with the Shapiro Wilk test. Numerical variables were presented as Mean±Standard deviation or median (25th-75th percentile), and categorical variables were presented as frequency (percentages). The difference between times was evaluated with the Wilcoxon t-test in continuous variables without normal distribution and with McNemar Exact chi-square in categorical variables.  $p < 0,05$  was considered significant in two-way tests.

## 2. RESULTS

The mean age of the students was  $20 \pm 1,35$ , and 80,2% of them were female. The highest participation in the training was found to be 22% (n=48) in 2019 (Table 2).

**Table 2: Distribution of Students' Characteristics**

Characteristics	Mean ± SD	n	%
Mean age (min.-max.)	20 ±1.35 (18-27)	178	100
Gender	Female	175	80,2
	Male	43	19,8
	Total	218	100
Number of students by year			
2013		19	8,7
2014		21	9,6
2015		24	11
2016		31	14,2
2017		31	14,2
2018		44	20,18
2019		48	22,01
<b>Total</b>		218	100
p (KW)			0,406

SD: Standard Deviation; Min.: Minimum; Max.: Maximum; KW: Kruskal Wallis

After the TDTA, students' self-confidence in ambulance driving increased, the prevalence of their stress caused by using ambulance decreased ( $p=0,014$ ;  $p=0,03$  respectively), and a statistically insignificant decrease was seen in their willingness to use an ambulance (Table 3) ( $p > 0,05$ ).

**Table 3: Comparison of Students' Pre and Post TDTA State of Feelings regarding Ambulance Driving**

State of Feelings regarding Ambulance Driving	Pre-TDTA						Post- TDTA						*p value
	Yes		No		Neutral		Yes		No		Neutral		
	N	%	n	%	n	%	n	%	n	%	N	%	
Self-confidence in ambulance driving	95	%53,4	83	%46,6	0	0,0	146	%82	32	%18	0	0,0	p=0,014
Stress caused by ambulance driving	122	%68,5	56	%31,5	0	0,0	93	%52,2	85	%47,8	0	0,0	p=0,03
Willingness to drive ambulance	116	%65,2	48	%27	14	%7,8	107	%60,1	49	%27,5	22	%12,4	p>0,05

\*: McNemar Exact Chi-square

After the TDTA, a statistically insignificant decrease was also observed in the students' anxiety levels caused by adverse weather conditions, intense traffic conditions, and in the anxiety related to ambulance use that would negatively affect the care of the patient in the cabin. On the other hand, there was a statistically significant increase in the prevalence of anxiety about ambulance driving without resting well enough, which may harm their driving (Table 4, p=0,03).

**Table 4: Comparison of Students' Anxieties about Ambulance Driving**

Students' Anxieties	Pre-TDTA				Post-TDTA				*p value
	Yes		No		Yes		No		
	n	%	n	%	N	%	n	%	
I think I may be negatively affected by ambulance driving at night	86	%48,3	92	%51,7	86	%48,3	92	%51,7	p>0,05
I think I may be adversely affected by ambulance driving on a 24-hour shift (not resting enough)	114	%64,0	64	%36,0	131	%74,1	47	%25,9	p=0,03
I think I may be negatively affected by ambulance driving in heavy traffic conditions	132	%74,2	46	%25,8	119	%66,9	59	%33,1	p>0,05
I think I may negatively affect patient care while driving the ambulance.	100	%56,2	78	%43,8	89	%50,0	89	%50,0	p>0,05
I think I may be adversely affected by weather conditions while driving the ambulance.	140	%78,7	38	%21,3	133	%74,7	45	%25,3	p>0,05

\* McNemar Test

After the TDTA, a statistically significant increase was seen in the prevalence of students who realized their lack of knowledge regarding traffic rules, stress, lack of self-confidence, being inexperienced, reverse maneuvering, parking, and gaining control in the ambulance (Table 5, respectively  $p < 0,01$ ;  $p = 0,04$ ;  $p < 0,01$ ;  $p = 0,01$ ).

**Table 5: Comparison of Pre-and Post-TDTA Lack of Knowledge Determined by Students**

Pre –TDTA	Post-TDTA				
<b>Deficiencies</b>	Deficiencies about traffic rules				
		Yes (n)	No (n)	Total (n)	*p value
Deficiencies about traffic rules	Yes (n)	1	2	3	$p < 0,01$
	No (n)	22	153	175	
	Total (n)	23	155	178	
Stress, lack of self-confidence, being inexperienced	Stress, lack of self-confidence, being inexperienced				
	Yes (n)	10	16	26	$p = 0,040$
	No (n)	31	121	152	
Total (n)	41	137	178		
Reverse maneuvering, inability to park	Reverse maneuvering, inability to park				
	Yes (n)	4	6	10	$p < 0,01$
	No (n)	33	135	168	
Total (n)	37	141	178		
Deficiency in ambulance control/ inability to start the ambulance	Deficiency in ambulance control/ inability to start the ambulance				
	Yes (n)	1	2	3	$p = 0,01$
	No (n)	17	158	175	
Total (n)	18	160	178		

Before the TDTA, the lowest and the highest knowledge scores of the students were 14 and 100, and the average score was  $65,32 \pm 19,35$ . After the TDTA, the lowest and the highest information scores were 43 and 100, and the average score was  $85,52 \pm 11,98$ . When the information score distributions were analyzed by years, a statistically significant change was seen in the traffic rules average scores of the students in all years apart from 2015 ( $p < 0,001$ ). When the average of ambulance driving practice performed by the TDTA trainers based on checklists was examined, it was found that the lowest score was 62, the highest score was 100, and the 7-year average was  $87,7 \pm 4,7$ . Post-training scores are presented in Table 6.

**Table 6: Comparison of knowledge levels of students about traffic rules to be obeyed while driving an ambulance (n=178)**

Knowledge Questions	Pre-TDTA				Post-TDTA				p value	
	Right		Wrong		Right		Wrong			
	n	%	N	%	N	%	n	%		
Accelerating/ decelerating rules	116	65,2	62	34,8	169	94,9	9	5,1	p<0,01	
Safety rules for curvy roads	164	92,1	14	7,9	173	97,2	5	2,8	p<0,01	
Intersection rules	72	40,4	106	59,6	162	91,0	16	9,0	p<0,01	
Speed limits	78	43,8	100	56,2	146	82,0	32	18,0	p<0,01	
Slipping	171	96,1	7	3,9	174	97,8	4	2,2	p>0,05	
Signal	80	44,9	98	55,1	80	44,9	98	55,1	p>0,05	
Right of way	134	75,3	44	24,7	173	97,2	5	2,8	p<0,01	
<b>TDTA driving practice mean scores by years</b>									<b>TDTA driving practice mean scores by years</b>	
2013	No Questionnaire was applied								94,68	
2014									79,85	
2015	93,45±10,38				90,04±7,8				p>0,05	94,32
2016	64,30±14,50				89,12±7,04				p<0,01	84,87
2017	60,16±11,26				87,71±8,07				p<0,01	85,00
2018	63,36±19,39				81,5±14,48				p<0,01	85,00
2019	57,06±17,40				86,90±14,50				p<0,01	90,01
Five-year mean score (n=178)	65,32±19,35				85,52±11,98				p<0,01	87,84
<b>7-year TDTA driving practice score (n=218)</b>									<b>87,70±4,77</b>	

When knowledge questions were grouped and analyzed, a statistically significant increase was detected in all other knowledge scores, except for the slipping control and signaling rules in the post-TDTA compared to the pre-TDTA (Table 6, p<0,01).

**Table 7: Distribution of Contribution of TDTA by Topics**

Topics	n	%
1. No Contribution	19	10,7
2. Practicing chain installing, tire changing, battery charging etc.	7	3,9
3. Increase in experience and self-confidence	26	14,5
4. Increase in maneuverability, parking, reversing, panic braking etc. practices	42	23,6
5. Stress and excitement control	25	14,0
2., 3. and 4. items	24	13,5
2. and 4. items	4	2,2
3. and 4. Items	30	16,9
2., 3., 4. and 5. items	1	0,6
<b>Total</b>	<b>178</b>	<b>100,0</b>

The students' responses to the question "How did the training contribute to you?" were examined, and the highest two contribution areas were found in ambulance driving such as maneuverability, parking, panic braking (23,6% (n=42)), gaining experience, self-confidence, and maneuverability (16,9% (n=30)) (Table 7).

### 3. DISCUSSION

Major occupational risks for pre-hospital emergency medical personnel are reported to be sharp object injuries, biological agents, exposure to violence, drugs, chemicals, non-ergonomic conditions, stressful working conditions, and ambulance accidents (Reichard et al., 2017:422; Galazkowski et al., 2015:682-84; Roberts et al., 2015:490; Bentley and Levine, 2015:99; Yenal and Ergör, 2013:33; Yenal et al., 2020:78). Ekşi et al. determined that the risk of death from ambulance accidents in pre-hospital emergency medical personnel was 21,4/100,000 in Turkey, while this ratio was 9,6/in the US. The same study examined ambulance accidents between 2009 and 2013 and found the possibility of having an ambulance accident in pre-hospital emergency medical personnel in Turkey as 69.4% (Ekşi et al., 2015:128-130). Additionally, the Core Content of Pre-Hospital Emergency Health Services published in 2019 included the training for paramedics to be qualified to take precautions against occupational risks (Delbridge et al., 2019:33). For the prevention of accidents which is a major occupational risk for paramedics in Turkey, ambulance drivers must be experienced and well-equipped in traffic in addition to regulating the traffic rules, creating social awareness, increasing the number of ambulance stations, and reducing the number of cases per team. Our study focused on the analysis of the TDTA training carried out for this purpose and revealed that it enhanced students' self-confidence in ambulance driving, reduced their stress, and made them more willing to enhance their level of knowledge of traffic rules.

The presence of stress factor was detected in the evaluation of the effectiveness of the TDTA training. Yenal et al. (2020) reported 64,2 % of ambulance drivers, paramedics, and EMTs expressed that driving an ambulance caused increased stress. Various studies on simulation training in nurses showed improved self-confidence after the training (Lubers and Rossman, 2016:93-96; Samawi et al., 2014:408). It is thought that through practical applications and debriefings in the TDTA training in our study, a decrease in stress, and an increase in self-confidence may have been achieved. During ambulance driving, stress and lack of concentration are considered among the driver-related reasons for traffic accidents (Koski & Sumanen, 2019:45-48). Since high stress can disrupt concentration (Durna, 2006:319), a decrease in students' stress related to ambulance driving is interpreted as a growth in terms of ensuring concentration. In a study on ambulance staff, Koski and Sumanen (2019) suggested that stress factor disturbs road safety. Kahn et al. (2001) found a similar result and concluded that the stress factor seriously threatens road safety, especially in inexperienced drivers. Accordingly, it can be thought that the TDTA training achieved its purpose with a decrease in the sense of stress and an increase in the sense of self-confidence.

In our study, the TDTA training generally caused a decrease in anxiety levels of students caused by driving an ambulance. However, there was no change in anxiety levels about night ambulance riding. Yenal et al. (2020) stated that 45.7% of paramedic and EMTs are affected by day/night ambulance driving, which is in line with our results. As the TDTA was given during the daytime, students could not experience the ambulance driving practice at night. Therefore, this limitation may be the reason why the anxiety before and after the TDTA was at the same level. Various studies indicate that ambulance accidents are more common between 12:00 and 18:00 in the daytime (Sanddal et al., 2010:2; Reichard et al., 2017:425; Garus-Pakowska et al., 2016:213). Considering the literature, it is possible to say that the driving training given during the daytime can contribute to reducing ambulance accidents. The anxiety caused by driving an ambulance without resting/sleeping enough increased after the TDTA. In studies with pre-test-training (theoretical or demonstration/simulation)-post-test form, anxiety level has generally been found to decrease (Labrague et al., 2019: 358; Burns et al.,2010:87-89) This result in our study may have resulted from the fact that the TDTA was given in hot weather and took approximately 8 hours. Also, students may have realized that using ambulances is a serious and tiring job, and this situation led to an increase in anxiety caused by driving the ambulance sleepless. A report published by EMS in 2015 noted that half of the emergency healthcare workers experienced fatigue, which increased the risk of malpractice and endangered ambulance driving (Smith, 2015:92-93). Students' anxieties in this direction are consistent with the literature.

The slight decrease in the level of anxiety about using the ambulance in heavy traffic conditions and adverse weather conditions supports the suitability of the TDTA training. In the TDTA training, it is possible to comment that the decrease in the prevalence of this anxiety in students may contribute to reducing the risk of ambulance accidents that may occur in the future. In addition, Yenal et al. (2020) reported that 51% of the drivers who were affected by the weather conditions had previously been involved in a traffic accident. Koski and Sumanen (2019) emphasized that environmental factors are among the major causes of ambulance accidents. Through the TDTA training, it was aimed to prepare students for environmental factors, and as a result, their anxiety levels decreased in line with this goal, which is considered a positive outcome.

In our study, after the TDTA, a significant increase was observed in all parameters that students felt inadequate. The highest increase was seen in the areas of inadequacy in gaining control in starting the vehicle and in reverse maneuvering and parking. We think that the debriefing given by the trainers contributed to the students' realization of their deficiencies. In a

study by Yenil et al. (2020), 61% of driver paramedics indicated that “the time they lost while parking the ambulance will affect patient care”. As gaining control in ambulance and maneuverability are among the most significant criteria for safe driving, students need to recognize these inadequacies. This difference supports that students' inadequacies can be seen through the driving practice (Johnston and Scialfa 2016:91). Various studies on this subject also emphasize that professional driving experience has a positive effect in identifying and responding to possible road hazards (Fisher et al., 2003:2, Horswill et al., 2013:100; McKenna et al., 2006:1-3; Crundall, 2016:47).

With the TDTA, the goal of “knowing about the traffic rules”, which is one of the main objectives of the TDTA, was achieved. Many studies designed as pre-test-training-post-test show that training increases the knowledge level of the participants (Mert Boğa et al., 2018: 93-94; Özyürek et al., 2013:183-185; Bayraktar et al., 2009:47-52). This result in our study is consistent with the literature. Kanh et al. (2001) highlighted that healthcare workers must have a higher level of competence in traffic rules and ambulance driving than other people. According to the World Road Safety Report published by the World Health Organization (WHO) in 2018, every time the vehicle speed increases by 1% from the speed limit set by law, the risk of lethal accident increases by 4%. In a report published by EMS about ambulance accidents in 2015, it was indicated that the causes of ambulance accidents are the same as other civilian vehicles, but the workflow and nature of the emergency health services may increase the vulnerability to accidents (Smith, 2015:91-93). Considering all this information, it has been concluded that training on the traffic rules, especially acceleration, panic braking, fast driving practices with a siren on may contribute to reducing the risks of ambulance accidents in the future.

In our study, experience, self-confidence, stress, and excitement control were defined as gains from the TDTA by the students, suggesting that the training achieved its goals. In a study conducted by Koski and Sumanen (2019) with paramedic students, one of the shortcomings related to ambulance driving in the education curriculum reported by students was the insufficient or lack of ambulance driving practice. With this study, it is thought that a positive step has been taken to solve the problem.

## ***Limitations***

The limitations of the study were as follows; the insufficient research on the issue has made it challenging to discuss our study findings with the literature. Since the questionnaire forms were filled in anonymously, and only students' e-mail addresses were asked to be written,

it was not possible to match the students' ambulance driving practice scores, so only pre-and-post-TDTA questionnaire forms could be matched. No scale was used in the questionnaire applied to the participants without the pilot study. Finally, because the questionnaire forms have started to be applied since 2015, students who received the TDTA course in 2013 and 2014 were included in the study only in terms of driving practice scores and were excluded from the study in terms of questionnaire scores.

## CONCLUSION

We suggest that the application of realistic training such as role-play, demonstration, and simulation that are used to promote case experiences of paramedics before graduation should also be increased in the ambulance driving course. The TDTA increased both the students' knowledge and skills of using ambulances and their self-confidence and reduced stress. However, further comprehensive studies should be conducted to investigate how much of these effects are reflected in the participants' future professional lives.

## Author Contributions

Concept SAY, SM, MP; Design SAY, SM, MP; Materials SAY, SM, MP; Data Collection&/or Processing SAY, SM, MP; Analysis/ Interpretation SAY, SM, MP; Literature Search SAY, SM, MP; Writing SAY, SM, MP.

## Conflict of Interest

The authors declared no conflict of interest.

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