IATSS Research 45 (2021) 382–388

Contents lists available at ScienceDirect

IATSS Research

Research Article

What predicts the number of attempts to pass the driving test? A case from Norwegian driving education model

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ARTICLE INFO

Article history:
Received 27 August 2020
Received in revised form 12 March 2021
Accepted 6 April 2021
Available online 1 June 2021

Keywords:
Driving education
Practical test
The number of attempts
Training time
Age
Gender
Norway

ABSTRACT

This study focuses on examining the relationships between the variables within the driving education process in Norway by aiming to answer three research questions: 1) Is there a difference between learner drivers above and below 25 years old in time spent at different steps and between theory and practical tests? 2) Do the time spent during different steps of the driving education, the number of attempts in the theory and practical tests differ by demographic variables? 3) What variables predict the number of attempts to pass the practical test? Data were extracted from two registry systems provided by the Norwegian Public Roads Administration. It included information from a randomized sample of 452 learner drivers who took their driving license in 2017. The age mean of the learner drivers when they got their license was 24.3 and most of them (54.6%) were males. Independent samples *t*-test results showed that compared to the learner drivers below 25 years, those above 25 years old spent significantly more time during steps 3 and 4, and had significantly more attempts to pass both theory and practical tests. In terms of the demographic variables, age was significantly and positively correlated with the time spent during the whole driving education and the number of attempts both in the theory and practical tests indicating that time spent for driving education and the number of attempts in the tests tend to increase with the increasing age. Also, the average time spent between taking the theory test and completing step 4 was significantly more among males than females. Test location had no significant influence on the number of attempts to pass the practical test. Finally, two separate regression analyses were conducted to examine the predictors of the number of attempts to pass the practical test for learner drivers both below and above 25 years old. For both groups, the strongest predictor of the number of attempts in the practical test was time spent between the theory test and the practical test, which indicates that as the time gap between the two tests increases learner drivers are more likely to fail at the practical test. Results are discussed for their implications which could be useful to improve the driving education process both in Norway and in other countries with similar driving education models.

1. Introduction

Although the common aim of driving education is to provide the learner drivers with the technical and safety skills required to be a responsible driver, the content and the focus of it show considerable differences between different parts of the world. In most of the European countries, driving education models are based on some theoretical frameworks, such as Goals for Driver Education (GDE) [1], however, in some other countries, such as the United States and Australia, driving education is based on long-lasting and supervised training models that refer to graduated driver licensing (GDL) [2]. Whereas the GDE framework emphasizes the importance of the higher-order factors, such as motivations, attitudes, and self-assessments, for safety, the GDL framework emphasizes the important role of driving practice on skill acquisition.

Most of the previous studies aiming to evaluate the effectiveness of the driving education models have focused on post-license traffic behaviors and crash involvement of the drivers [3,4,5]. However, relationships between the variables within the driving education process, such as the amount of training time and success rate in theory and practical tests, are rarely examined. There are different findings regarding the relationship between pass rate at the practical test and post-license accident involvement of the novice drivers. Some studies indicate that those who fail at the practical test several times are more likely to be involved in crashes after they get their licenses. For example, one previous study showed that those who failed the practical test at least four times had a significantly increased risk of crash involvement later compared to those who passed the test for the first time [6]). Similarly, Keall and Frith [7] reported that each failure at a practical test was associated

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Peer review under responsibility of International Association of Traffic and Safety Sciences.

https://doi.org/10.1016/j.iatssr.2021.04.002

with a 33% increase in the injury crash involvement among elderly drivers. On the other hand, there are also some other findings showing that a low pass rate at the practical test is not associated with higher accident involvement in all cases. For example, some previous studies show that although the pass rate for older learner drivers was significantly lower than the younger learner drivers, later on, accident involvement of the older novice drivers was lower compared to the accident involvement of the younger novice drivers [8,9]. Therefore, it appears that the relationship between pass rate at the test and post-license accident involvement of the novice drivers is not so simple and clear. It is possible that some individual factors, such as attitudes and motivations of novice drivers, might be influencing the relationship between pass rate and accident involvement [9]. Despite different findings, these studies point out that the number of attempts to pass the practical test is a variable that tends to be associated with the future crash involvement of the drivers. Therefore, it might be useful to investigate the variables within the driving education process that might influence the number of attempts at the practical test. The focus of the present paper is to examine relationships between various variables connected with the driving education process (e.g. test location, demographic characteristics of the learner drivers, time spent at different steps, the outcome at the theory and practical tests), and how they influence the outcome of the practical test in a Norwegian sample.

1.1. Norwegian driving education model

The Norwegian driving education model is based on the Goals for Driving Education (GDE) framework, which emphasizes the importance of developing higher-order skills, such as self-assessment and risk awareness, for safe driving [1]. GDE includes four hierarchical levels, which are 1) vehicle maneuvering, 2) mastering traffic situations, 3) goals and context for driving, and 4) goals for life and skills for driving. The first two levels, which are vehicle maneuvering (controlling the vehicle) and mastering traffic situations (adapting to demands of the traffic situations), are important for operating a car in traffic. The third level focuses on the important role of planning, trip-related goals, and driving context for safe driving, whereas the fourth level in the hierarchy focuses on lifestyle and motivational factors for safe driving. In 2010, a fifth level called “social environment” was added to the model [10]. This level was added to cover aspects of the social environment, such as culture, group values, and norms, that influence driving. All levels in the model are important for safe driving, and there are interactions between the levels, thus changes at both higher and lower levels of the hierarchy affect the whole system [1].

Based on the GDE framework, the Norwegian driving education is divided into four steps (see Fig. 1). The learner driver is supposed to reach the goals for each step before moving on to the next. To ensure this, there are mandatory assessments after step 2 and step 3. During these assessments, learner drivers are supposed to discuss to what extent the goals have been met based on their performance [11]. The purpose of these assessments is to develop learner drivers' ability to assess their strengths and weaknesses. An additional aim of the assessments is to support the learning process [12]. This self-assessment is pointed out as one of the main columns in the GDE-matrix [1]. There are some differences in the training process for the learner drivers above and below 25 years old. Learner drivers above 25 years old are exempt from some parts of step 1. They only must complete the dark driving and first aid training from step 1 but exempt from the rest of the basic traffic course.

Different from many other countries that offer a quick route to the acquisition of the driving license, driving education in Norway is extensive, systematic, and comprehensive [13]. The age limit for driving education is 15 years for step 1 and 16 years for step 2. One of the reasons for this is to provide learner drivers with more experience before starting driving on their own. The main purpose of driving education in Norway is to help learner drivers achieve driver competence. Driver competence is defined as the knowledge, skills, attitudes, and motivation needed by drivers to be able to handle the traffic environment safely [11,p. 10]. Some of the teaching objectives intended to contribute to this competence cannot be included in a practical test for different reasons, such as being too time-consuming to measure in a test. To ensure that these subjects are nonetheless included in the training, mandatory courses have been established in the Norwegian driving training model [11]. These courses focus on topics that are represented in the higher-order levels of the GDE framework, such as road safety attitudes and motivations. Student activity is a precondition for developing higher-order skills, and this is emphasized as a goal in the curriculum [11].

In terms of testing the learner drivers, Directive 2006/126 / EC of the European Parliament and of the Council of 20 December 2006 on driving licenses sets the minimum requirements for the driving test, both the theoretical and practical part [14]. The Directive, part 18, emphasizes ensuring a more objective evaluation of driving license applicants and achieving a greater harmonization of practical tests. Still, the practical test differs a lot in the European countries, both in time and content [15]. The Norwegian theory test is a standardized digital test of 45 randomized questions. The theory test is supposed to assess the knowledge and rules related to driving, liability, regulations, signposts, road marking, and the vehicle. In the Norwegian practical test, the examiner shall assess whether the candidate has sufficiently achieved the goals set for education set in section 11–1 of the Regulations and the Curriculum for driving license Category B [16]. The applicant shall possess the skills and knowledge, self-insight, and understanding of risk required to drive in a manner, which is safe, provides proper interaction, promotes efficient traffic flow, is in compliance with regulations in force, and shows consideration for health, the environment and the needs of others.

1.2. Variables that might influence the driving education process

1.2.1. Training time

Previous research [17,4,5] has shown that amount of both formal (i.e. training with the professional teacher) and informal training

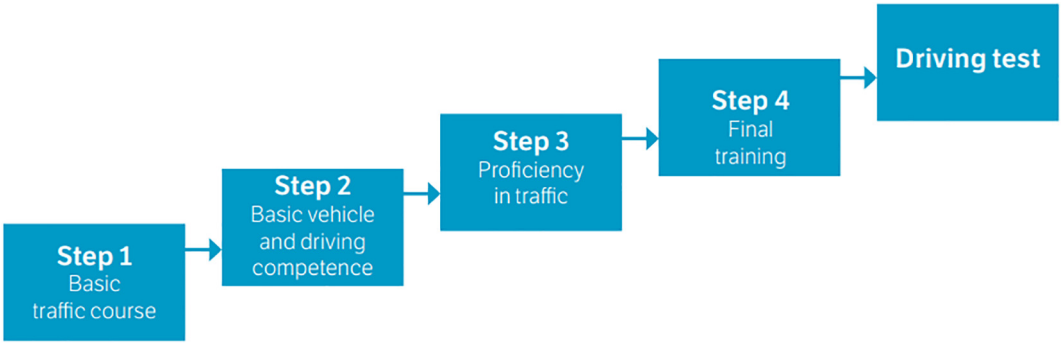

Fig. 1. Step-by-step training [11,p.14].

(i.e. training with a lay instructor) among the learner drivers is related to several important outcomes, such as safety attitudes, self-assessment skills and behaviors in traffic. Although there are some differences between the effects of formal and informal training [17], overall the previous findings indicate that a higher amount of training during the driving education process leads to increased driving skills among the learner drivers and consequently contribute to the reduction of further crash involvement [4]. Except from only a few previous findings showing a weak association between the amount of training and pass rate at the practical test [17], little is known about the relationship between the amount of time used for driving training and outcome at the theory and practical test.

1.2.2. Location of the driving training and the practical test

The location of the driving training and the practical testmight also be related to the test outcome. During the driving training, learner drivers often drive on different types of roads, including urban and rural roads, to acquire the necessary skills to handle the car in different traffic environments. However, still, there might be considerable differences between different locations, where the learner drivers take most of their training and the practical test, in terms of environmental conditions (weather and road conditions) and traffic volume. A learner driver who has taken his/her driving training in a small town with fewer cars might find it challenging to drive in a big city with a high traffic volume and more complex traffic system. Hence, there is a common conventional belief that taking the practical test in a small town with less traffic rather than a big city increases the success rate in the practical test. Therefore, it seems that from the learner drivers' perspective location of the practical test is important. However, little is known about whether the location of the practical test has indeed a role in the outcome of the practical test. Although there are a few previous studies reporting time of training in different road and weather conditions [17], to our knowledge there is no previous study examining whether the characteristics of the location where the practical practical test takes place (size of the city, traffic volume, etc.) are significantly associated with the outcome of the test (number of attempts). Therefore, in addition to the time spent during different steps of driving education, the present study will also examine the relationship between test location and outcome.

1.2.3. Demographic characteristics of the learner drivers

Previous studies examining the gender and age differences in crash involvement clearly show that being male and young are positively associated with driving violations and crash involvement [18,19,20], and young male drivers are more prone to show higher sensation-seeking, risk-taking, and lower traffic risk perception [21,22,23]. Based on these previous findings it could be expected that demographic characteristics, such as age and gender, could also have an influence on the performance of the learner drivers during the driving education process. Studies examining the relationship between demographic characteristics of the learner drivers and driving education process-related variables, such as training time and outcome at the theory and practical test, are limited. A few previous studies examining the gender differences in the outcome of the practical tests show that compared to males, female learner drivers practice driving in a more structured way and perform better on the theory test [24,25]. In terms of age effects on the outcome of the practical tests, it appears that older age tends to be negatively associated with the pass rate at the practical test, especially above a certain age. For example, Groeger and Brady [17] have reported that the age of the learner driver did not make a significant difference at the practical test outcome up till the age of 30 years old; however, above the age of 30 years old those who passed the test were significantly younger than those who failed. This is in line with the literature related to the age-related differences in motor-skill learning, which shows that motor performance tends to decline with aging especially in complex tasks [26,27]. Since learning to drive a car is a highly complex task, older drivers with decreased motor-learning skills likely need a longer time to develop the skills required for driving a car.

1.3. Aims of the present study

The main aim of the present study is to examine the relationships between the variables within the driving education process, which are training time, training location, the demographic profile of learner drivers, the number of attempts in the tests (how many times the learner driver attends a test before he/she passes the test), in a Norwegian sample of learner drivers. An additional important aim is to examine the predictors of the number of attempts to pass the practical test. The specific research questions are:

1) Is there a difference between learner drivers above and below 25 years old in time spent at different steps and between theory and practical tests?
2) Do the time spent during different steps of the driving education, the number of attempts in the theory and practical tests differ by gender, age, and training location?
3) What variables predict the number of attempts to pass the practical test?

2. Methods

2.1. Data collection

The data were extracted from two registry systems, Autosys and TSK, belonging to the Norwegian Public Roads Administration. Both systems include information related to learner drivers who take driving education in different regions of Norway. TSK is the register for mandatory courses and Autosys contains data for the theoretical and practical practical test. Information from a randomized sample of learner drivers who took their driving licenses in 2017 was used for the present study. The specific variables extracted from the systems for the present study were: gender and age of the learner drivers when they got their driver's license, traffic station where the learner drivers took their driving license, dates for completing the mandatory courses and steps, dates for the theory and practical test, and finally the number of attempts to pass the theory and practical tests. It should be noted that learner drivers are defined as those who have not passed the practical test yet even if they have completed the driving education. Before accessing the data, ethical approval for the study was taken from the Norwegian Center for Research Data (NSD).

2.2. Sample characteristics

There were a total of 452 cases included in the study. Two hundred forty-seven (54.6%) of them were male and 205 (45.4%) of them were female. The age mean was 24.3 (SD = 8.15). Most of the learner drivers (43.6%) took their practical test in a medium-sized town with a population of 20.000 to 100.000 inhabitants. Whereas 30.2% took the test in big cities with a population of more than 100.000 inhabitants, and 26.2% took the test in a small-sized town with a population of fewer than 20.000 inhabitants.

3. Results

3.1. Differences in time spent at different steps between learner drivers below and above 25 years old

In order to answer the first research question of the study *"Is there a difference between learner drivers above and below 25 years old in time spent at different steps and between theory and practical tests?"*, independent sample *t*-test analyses were conducted.

Table 1
Average time (days) spent on different steps of the driving education process and number of attempts in the theory and practical tests.

	Below 25 years old (n = 298)		Above 25 years old (n = 154)		
	Mean	SD	Mean	SD	*t*-value
Step 1 - Basic traffic course[a]	55.91	289.53	NA	NA	–
Step 2 – Basic vehicle and driving competence[b]	761.60	449.93	995.76	1454.41	–
Step 3 – Proficiency in traffic	96.34	127.72	256.84	579.01	−4.57***
Step 4 – Final training	45.79	79.34	230.40	688.51	−4.54***
Time difference between step 4 and step 2	141.84	152.36	486.38	878.15	−6.58***
Time difference between the theory and practical test	76.24	56.97	104.88	115.33	−3.53***
Time difference between practical test and level 4	61.98	163.32	242.84	641.73	−4.54***
Number of attempts in the theory test	1.47	0.98	2.03	1.88	−4.18***
Number of attempts in the practical test	1.15	0.42	1.29	0.72	−2.56*

* $p < 0.05$.
*** $p < 0.001$.
[a] Those above 25 years old are exempt from the basic traffic education.
[b] Time spent for step 2 is calculated differently for the two groups. For those below 25 years old it is the time period between the dates for completing the Step 2 and Step 1. However, for those above 25 years old it is the time period between the dates for completing step 2 and first aid course.

Results are shown in Table 1. Compared to the learner drivers below 25 years, those above 25 years old spent significantly more time during step 3, step 4, between step 2 and 4, between step 4 and practical test, and between the theory and practical test. Besides, learner drivers above 25 years old had significantly more attempts to pass both theory and practical tests, compared to the learner drivers below 25 years old.

3.2. Differences in the variables of the study by age, gender, and test location

In order to answer the second research question of the study *"Do the time spent during different steps of the driving education, the number of attempts in the theory and practical tests differ by gender, age, and training location?"*, several statistical analyses were run. First, independent sample *t*-tests were conducted to examine whether time spent for different levels of driving education and the number of attempts in the tests differ by gender. No significant gender difference was observed in the variables of the study except the time difference between taking the theory test and completing the whole driving education. Results show that the average time spent between taking the theory test and completing step 4 was significantly more among males ($M = 67.9$, $SD = 484.5$) than females ($M = -7.1$, $SD = 273.9$), [$t(439) = 1.96$, $p < 0.05$]. This finding indicates that compared to women, men take the theory test significantly later in the driving education process, often after completing step 4.

Secondly, to examine the relationship between age and time spent on different steps of driving education and number of attempts in the tests, Pearson r correlations were conducted. Results show that age is significantly and positively correlated with the time spent for step 2 ($r = 0.48$, $p < 0.01$), step 3 ($r = 0.13$, $p < 0.01$) and time spent between step 2 and step 4 both for those below ($r = 0.67$, $p < 0.01$) and above 25 years old ($r = 0.10$, $p < 0.05$). In addition, age is significantly and positively correlated with the number of attempts in the theory ($r = 0.18$, $p < 0.01$) and practical tests ($r = 0.13$, $p < 0.01$). Overall, these results indicate that time spent on driving education and the number of attempts in the theory and practical tests tend to increase with the increasing age.

Finally, a one-way ANOVA was conducted to compare the effects of the test location (small-sized town, medium-sized town, and big city) on the variables of the study. The only significant difference was observed in the time spent for the whole driving education for those below 25 years old [$F(2,447) = 3.90$, $p < 0.001$], which shows that the learner drivers spent more time to complete the driving education process as the population size of the location where they took the practical test increased.

3.3. Predictors of number of attempts in the practical test

In order to answer the third research question of the study *"What variables predict the number of attempts to pass the practical test?"*, two separate hierarchical multiple regression analyses were conducted for those below and above 25 years old. The number of attempts in the practical test was entered as the dependent variable. In terms of the predictor variables, gender, age, and location of the practical test were entered in the first step, whereas time spent in different steps and the time difference between the two tests and between the practical test and step 4 were entered in the second step. For the learner drivers below 25 years old, age and time difference between the theory and practical test were significantly and positively related with the number of attempts in the practical test, whereas time spent during step 2 was significantly and negatively related with the number of attempts in the practical test (see Table 2). For those above 25 years old, on the other hand, the only significant predictor was the time difference between the theory and practical test, it was positively related to the number of attempts in the practical test (see Table 3). For both age groups, time spent between the theory and practical test was the strongest variable predicting the number of attempts to pass the practical test, which indicates that as the time gap between the two tests increases the number of attempts in the practical test tends to increase.

4. Discussion

Despite some studies examining the connection with the driving education process and risky behaviors and crash involvement of the novice drivers [3,4,5] there is a lack of studies examining the relationships between the variables within the driving education process, such as training time at different steps, demographic characteristics of the learner drivers and number of attempts at the theory and practical

Table 2
Predictors of number of attempts to pass the practical test for those below 25 years old.

Step	Variable	Beta	R^2	Change in R^2	F
1			0.02	0.02	2.36
	Gender	0.07			
	Age	0.16*			
	Traffic Station	−0.02			
2			0.16	0.14	5.49***
	Time spent during basic traffic course time	0.06			
	Time spent during step 2	−0.15*			
	Time spent during step 3	−0.07			
	Time spent during step 4	−0.08			
	Time difference between practical test and step 4	0.04			
	Time difference between practical test and theory test	0.33***			
	Number of attempts in the theory test	0.10			

* $p < 0.05$.
*** $p < 0.001$.

Table 3
Predictors of the number of attempts to pass the practical test for those above 25 yearsold.

Step	Variable	Beta	R^2	Change in R^2	F
1			0.02	0.02	0.95
	Gender	−0.11			
	Age	0.05			
	Traffic Station	0.09			
2			0.08	0.06	1.16
	Time spent for step 2	0.06			
	Time spent for step 3	−0.13			
	Time spent for step 4	−0.07			
	Time difference between practical test and step 4	−0.02			
	Time difference between practical test and theory test	0.19*			
	Number of attempts in the theory test	0.06			

* $p < 0.05$.

tests. The present study focused on examining the relationships between the variables within the education process (e.g. training time, training location, number of attempts at the tests) and predictors of the number of attempts to pass the practical test in a sample of Norwegian learner drivers.

The first research question of the study was whether there were differences between learner drivers above and below 25 years old in time spend at different steps and between theory and practical tests. Results show that compared to the learner drivers below 25 years those above 25 years old spent significantly more time during steps 3 and 4, between the theory and practical test, and had significantly more attempts to pass both theory and practical tests. The second research question was whether the time spent during different steps of the driving education, the number of attempts in the theory and practical tests differ by gender, age, and test location. The only significant gender difference shows that the average time spent between taking the theory test and completing step 4 was significantly more among males than females. Male students tend to take the theory test much later in the driving education process than female students. Age was significantly and positively correlated with the time spent for step 2, step 3, and with the number of attempts in the theory and practical tests. In terms of the test location (small-sized town, medium-sized town, and big city), the only significant difference was observed in the time spent between step 2 and 4 for those below 25 years old showing that learner drivers spent more time between step 2 and 4 as the population size of the location where they took the practical test increased. The final research question was what predicts the number of attempts to pass the practical test. For the learner drivers below the 25 years old, age and the time difference between the theory and practical test were significantly and positively related with the number of attempts in the practical test, whereas time spent during step 2 was significantly and negatively related with the number of attempts in the practical test. For those above 25 years old, only the time difference between the theory and practical test was significantly and positively related to the number of attempts in the practical test.

In terms of the demographic characteristics of the learner drivers, age appeared as a significant and important variable as the results showed that time spent at different steps and the number of attempts both in the theory and practical test increase with the increasing age. Besides, differences between the learner drivers below and above 25 years old clearly indicate that learner drivers above 25 years old spend longer time in all steps of the driving education and on average have more attempts to pass both theory and practical tests. There might be several explanations for these age-related differences. One likely explanation might be related to the lifestyle differences between younger and older learner drivers. Younger learner drivers mostly include students who have a higher chance of training with their family members. They might focus on driving education more as they are likely to have more spare time to use for driving education compared to the older learner drivers, who are likely to have a more demanding lifestyle due to work and family life. Also, since most of the younger learner drivers are students, they are more trained and used to learn and memorize new information, which might shorten the time spent on driving education. Another reason might be related to the decreasing cognitive abilities and motor-learning skills due to aging, which might lead to a longer time required for developing the skills required for driving a car among older learner drivers [26,27]. When interpreting the differences between learner drivers below and above 25 years old, it should be kept in mind that, compared to the learner drivers below 25 years old, those above 25 years old are more heterogeneous. Thus, it is likely that they have more various motivations for getting a driving license.

The only significant gender difference showing that compared to female students, male students took the theory test much later in the driving education process is in line with the previous studies indicating that female students are more structured in following the steps of the driving education process than the male students [24]. Test location did not have any significant effect on the number of attempts in the practical test. Therefore, this result falsifies the expectations of some learner drivers that taking the practical test in a small town with less traffic volume would increase the pass rate at the test. This could be explained by the fact that learner drivers in Norway most often take their practical test in the areas where they already train and get familiar during the education. The only significant difference in terms of the test location was that the learner drivers below 25 years old spent more time to complete the driving education process as the population size of the location where they took the practical test increased. It is likely that in towns with bigger populations there are more learner drivers and consequently traffic schools are busier. Therefore, there might be longer waiting times between different training sessions and obligatory courses. In addition, learner drivers are more likely to be university students who live away from family and thus have a limited possibility of training with a lay instructor in bigger towns. Moreover, in rural areas of Norway where there are smaller towns with limited public transportation services, the bigger need for a driving license might motivate the learner drivers to finish the driving training in a shorter amount of time.

Regression analysis results showed that the time difference between the theory test and practical test was significantly and positively related to the number of attempts in the practical test for the learner drivers both below and above 25 years old. This indicates that as the time gap between the two tests increases the learner drivers tend to fail at the practical driving test more. There might be several explanations for this finding. First, it is possible that when the learner drivers pass the theoretical test, they can assume they are done with theoretical knowledge. If neither the driving instructor nor the lay instructor challenge this knowledge during driving training and do not contextualize it, the theoretical competence can become weaker over time. Following the driving model in Norway, the learner driver can accomplish the theory test at the age of 17 ½ years old. This can be too early in the learning process, where the learner driver still doesn't get the chance to contextualize the theory to practical traffic situations. Social situations and human activity constitute each other, and all communication requires a context to be comprehensible [28]. Another explanation might be connected with the age-related lifestyle factors among learner drivers. Longer time between the two tests is associated with getting the practical test at an older age when it might be more difficult to prioritize driver training due to a more demanding and busier lifestyle. For instance, compared to a learner driver at the age of 18, a learner driver at the age of 30 might find it more difficult to focus and prioritize driver training due to work and family life. Furthermore, learner drivers above the age of 18 years old might have less possibility for lay instructor training as they are more likely to live outside their parents' house and without a car in the household. Based on the present data it is not possible to make strong arguments explaining why the time difference between the two tests varies for different learner drivers. However, it is very likely that above mentioned age-related lifestyle and social factors influence the

motivations of the learner drivers to get their license in a shorter or longer period. On the other hand, it should also be noted that in the Norwegian driving education process there are certain steps learner drivers must complete before they can take the practical test, and often there is clear guidance from the traffic schools and driving instructors about when to take the practical test. Thus, although some individual and motivational factors might influence when the learner drivers take the tests, their role is not so big as the process is mostly structured and predetermined.

For the learner drivers below 25 years old, age was positively related to the number of attempts in the practical test, which is in line with some previous studies showing that older age, especially being above 30 years old, is negatively related with the pass rate at the practical test [17]. In addition, time spent between completing step 1 and step 2 was negatively related with the number of attempts in the practical test for this age group, indicating that as there is more time between these two steps learner drivers are more likely to pass the practical test with fewer attempts. The focus of step 2 is to help the learner drivers to develop the technical skills and competence required for handling the vehicle. Thus, spending a longer time with training in step 2 might explain why students tend to be more successful at the practical test. However, it should be noted that the time spent between step 1 step 2 might also include a period of no progress or waiting time when nothing happens. Some of the learner drivers might have completed step 1 at high school and had to wait for starting step 2. Therefore, without knowing exactly how much time the learner drivers spent for training and waiting it is difficult to bring an explanation for why time spent between these two steps is negatively associated with the number of attempts at the practical test. Further research is needed to have a better understanding of how the time between steps 1 and 2 is spent and what is the role of training on the number of attempts at the practical test.

4.1. Implications of the study

The present study has some implications that might be useful to improve both the success rate at the practical test and the driving education process. One of the main findings of the present study shows that the time difference between the two tests was positively related to the number of attempts in the practical test. This finding implies that a longer amount of time between the two tests has a negative influence on the success rate of the drivers at the practical test. Thus, putting a shorter time between the two tests might be an advantage for the learner drivers. However, to have a clearer suggestion, we need to gain more knowledge regarding what is associated with a longer waiting time between the two tests for the learner drivers. Besides, our findings indicate that there are reasons to look deeper into the focus and needs of older learner drivers above 25 years old. There were clear differences in time spent between different steps and two tests between younger and older learner drivers. Older learner drivers may have different needs in terms of training time at different steps. Currently Norwegian driving education model has a focus on young drivers; however, to make it function successfully for all age groups it could be adjusted considering the needs and social and cognitive characteristics of the older drivers. In terms of the time spent between different steps, especially the shortest amount of time spent between steps 3 and 4 attracts attention. This is in contrast with the original plan of the education model that intends to allocate the longest amount of time for step 4, which is critical for developing safety skills and attitudes needed for being a responsible driver. Current data only indicates that time spent for step 4 is shorter than it is intended to be thus further investigation is needed for explaining the reasons for that.

4.2. Limitations of the study

Despite being the first study that focuses on the relationships between different variables within the Norwegian driving education process using a fairly representative sample, this study has also some limitations to mention. The data used for the present study, which was taken from the Public Roads Administration registry, was rather limited. It included some demographic information, dates for completing different steps, and the number of attempts for the theory and practical tests for the learner drivers within a certain period. However, it did not provide information about how much time exactly the learner drivers spent on training sessions and for waiting in some cases. Thus, the findings obtained based on the data were mostly descriptive but not so explanatory. In addition, since the present data could not provide us with possible individual factors (e.g. motivations, attitudes and lifestyle of learner drivers), it is not possible to make strong arguments explaining the differences in time spent at different steps and between two tests. Further research using more detailed data related to learner drivers and the driving education process is needed to provide a more clear and better understanding of factors influencing the pass rate of the learner drivers at the practical test. In addition, in future studies relationship between pass rate in the practical test and later crash involvement of the novice drivers could be examined to see whether these two variables are related.

5. Conclusions

The focus of the present study was to examine the relationships between different variables related to the driving training process and learner drivers and how these variables predict the number of attempts in the practical test within the Norwegian driving education model. Results indicate that time spent at different steps and the number of attempts in the theory and practical tests tend to increase as the learner drivers' age increases. Also, time spent between the theory and practical test appeared as an important predictor of the number of attempts in the practical test indicating that as the time gap between the two tests increases learner drivers are more likely to fail at the practical practical test. Findings point out that demographic characteristics of the learner drivers and variables related to the training process, such as time spent at different steps, are related, and they have a role in predicting the number of attempts in the practical test. The present study provides findings only related to the driving education process and test outcomes. How the variables within the driving education process, including test outcomes, might be related to the traffic behaviors and accident involvement of the novice drivers are planned to be investigated in a further follow-up study.

Declaration of Competing Interest

Authors declare no conflict of interest.

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