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Competition and its potential negative effect on safety in powered two-wheeler (PTW) training seen from a system perspective

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ABSTRACT

Competition is, in many ways, a source related to quality in the sense that less competitive firms will be outdistanced through a balance in supply and demand. In high-risk industries, however, safety must be balanced with production, which is not always an easy choice. In the rider training industry, driving schools and instructors teach others how to behave and think in and relate to a complex road traffic system while being vulnerable on a powered two-wheel (PTW) vehicle. Knowing which training is optimal is not easy, but the Norwegian learner curricula and regulations serve as guidelines. However, in competition with other driving schools, this training might be adjusted because of competitive elements in addition to the intentions of the curricula. Thus, our research question is 'How can competition affect the quality of the rider training system and thus road safety in Norway?' For this research, sixteen interviews were conducted, and thematic analysis was used for analysing the data. The findings in this study were that competition affects three factors of the rider training system related to safety. These were (1) course-related training, (2) less strict assessment, and (3) test-oriented training. The conclusion is that competition partly has a negative effect on safety in the rider training industry in Norway.

1. Introduction

Competition[1] is viewed as a means to increase quality and supply for customers through a balance in supply and demand and is regarded as a fundamental mechanism in a capitalist economy. However, increased competition in relation to safety in a high-risk industry, such as the transportation sector, is found to potentially increase risk, such as in road, maritime, rail, and aviation traffic (Couper, 2000; Elvik, 2006; Evans, 2013; Grinerud, Sætren, & Aarseth, 2020; Julsrud, Gjerdåker, & Thune-Larsen, 2011; Lobrigo & Pawlik, 2015; Mayhew & Quinlan, 2006; Mooren, Grzebieta, Williamson, Olivier, & Friswell, 2014; Nævestad, Hovi, Caspersen, & Bjørnskau, 2014). In such studies, safety involving active human errors (Reason, 1990) is typically examined. Research on more latent factors (Reason, 1990) which are more detached from the incident itself, such as how competition affects the quality of training in transportation, is less common. One factor found in this regard, however, looks into elements such as in the maritime sector, where the cost of training is minimised as training is more or less removed because of international competition and the lowest possible crew costs (Couper, 2000; Lobrigo & Pawlik, 2015). Research on how competition affects the quality of the road vehicle training industry, more specifically on PTWs, is harder to find. While research has been done on, for instance, how safety training should be conducted (e.g. Aupedit et al., 2013), little is found on how competition affects the quality of this training. In this paper, thus, the approach on competition and safety is from a system perspective based on the theoretical aspects of Rasmussen (1997) and Reason (1990).

Accident exposure for PTW riders in Europe is significantly higher

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[1] In economics, competition is often found to increase internal and external efficiency and give favourable outcomes for societies. However, without going into detail, one might, from an economist's perspective, consider our case here as a situation with asymmetric information where the sellers (the driving schools and instructors) know the quality of their teaching, while the buyers (the learners) do not have the same knowledge of the quality of the training or what they actual need to be a skilled rider. As commented on by the journal's reviewers and editor, such information asymmetry might weaken the possibility that competition improves efficiency in the market. However, we do not pursue this economical thinking here.

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compared to that of other vehicle road users (e.g. Bjørnskau, 2016; ERSO, 2018; Penumaka, Savino, & Baldanzini, 2014). Research has discovered risk factors for PTWs such as speed, gender, time of day, age, frequency of riding, weather conditions, licence-holding period, trip purpose, and presence of passengers (Bjørnskau, Nævestad, & Akhtar, 2012; De Rome et al., 2016; Keall & Newstead, 2012; Moskal, Martin, & Laumon, 2012). However, these factors are mostly related to the rider herself or himself or the immediate context. Factors considering the training system are less investigated (Sætren, Wigum, & Bogfjellmo, 2019; 2020), and we have little to no scientific knowledge regarding how competition in a capitalist economy for driving schools affects the quality of training PTW riders. Thus, our research question is 'How can competition affect the quality of the rider training system and thus road safety in Norway?'

The category AM146 is a unique Norwegian term for a two-wheeled moped licence. In Europe, the term is *AM* for the same licence. We will present risk factors for PTW riders, rider training programs for PTWs in Norway, and theoretical aspects of safety versus production as a theoretical framework for competition in high-risk systems (Rasmussen, 1997; Reason, 1990). Then the method and results will be presented, followed by a discussion linking the findings and the related theoretical framework and, finally, the conclusion.

2. Theoretical framework

2.1. PTW riders, risk, and training

Riding a PTW involves a higher risk in road traffic compared to operating other vehicles (e.g. ERSO, 2018; Bjørnskau, 2016; Penumaka, Savino, & Baldanzini, 2014). In Norway, the number of severely injured and dead individuals from all road traffic accidents in 2018 was 710. Of these, 164 (23%) were PTW riders. The average number in 2013–2018 was 781 severely injured and dead of all road users, and of these, 170 (22%) were PTW riders (SSB, 2020). Considering the few months per year when PTW riding is possible in Norway because of weather conditions during wintertime and that PTW counted for 6% of registered vehicles in Norway in 2018 (NPRA, 2020a), being involved in over 20% of the accidents with severe injury or death is considered high.

Additionally, the likelihood that injuries are more severe is also higher (Piantini et al., 2016) for several reasons. First, two-wheeled vehicles are considered more difficult to handle than four-wheeled vehicles. These difficulties include actions such as hard braking, swerving, and other evasive manoeuvres such as counter-steering because handling a two-wheeler involves more body movement than handling a car. In addition to this, the rider is not protected by the vehicle itself. This means that poor conspicuity and often poor protection by clothing are factors that contribute to a higher probability of severe injuries. Among PTW riders, younger riders (aged 16–18) are found to be more prone to accidents, and 22% of moped riders and 27% of A1 riders reported unwanted incidents during their first year of holding a licence (Bjørnskau et al., 2012; Sagberg & Johansson, 2018). Even though many risk factors are involved for younger riders on PTWs, the quality of PTW rider training is hardly mentioned. Thus, the effect of the training quality on the rider's skill level could be considered a knowledge gap. In the literature on rider training, each study is often found in one of three categories: (1) studies testing the effectiveness of post-test training, (2) studies describing the educational content of training, and (3) studies attempting to identify new educational content categories (Aupetit, Riff, Buttelli, & Espié, 2013). However, each theme is not covered in depth. Further, when looking into how curriculum training deals with safety, most studies analyse accident data or self-report surveys for PTW riders (e.g. Haworth & Mulvihill, 2005; Sagberg & Johansson, 2018). Further research implies that measuring the effect of training on safety is difficult (Helman, Greyson, & Parkes, 2010; Hirsch & Bellavance, 2016; Lonero & Clinton, 2006; Mayhew & Simpson, 2002), and a review study found the literature to be inconclusive on this matter (Kardamanidis, Martiniuk, Ivers, Stevenson, & Thistlewaite, 2010). Nevertheless, Norwegian road traffic is found to be one of the safest in Europe (ETSC, 2019). Furthermore, Norway is one of the nations with the most comprehensive driver training regimes, which might indicate that strong focus on driver training might be a factor.

2.2. Rider training system in Norway

The basis for most European (including Norwegian) driver training and thus a central element in all road traffic training and education in Norway has, for the past decade, been the goal for driver education (GDE) matrix (Hatakka, Keskinen, Gregersen, Glad, & Hernetkoski, 2002b). This matrix consists of five levels: vehicle manoeuvring, mastering road situations, the goals and context of driving, the goals and skills for living (Keskinen, 1996; in Hatakka, Keskinen, Glad, Gregersen, & Hernetkoski, 2002a), and social skills (Keskinen, 2014; Keskinen, Peräaho, & Laapotti, 2010). This level of thinking in driving has resulted in four-level rider and driver training in Norway for all licence classes, where Level 1 is theoretical, Level 2 is manoeuvring, Level 3 is tactical, and Level 4 is strategic (NPRA, 2016).

According to the current curriculum (NPRA, 2016), which is based on the GDE matrix, the main learning goal for A classes, including the AM146, is that the rider must have the adequate skills and knowledge necessary to responsibly operate the vehicle. To obtain this, the training consists of four levels. Level 1 is a theoretical course, which includes the elements of the rider's role in road traffic in addition to how to interact with other road users as well as basic safety, risk evaluations, and duties as a road user. On Level 2, the learner is taught basic vehicle handling and how to operate the moped or motorcycle. Level 3 consists of individual and on-the-road training, often referred to as a safety course on traffic (tactical). Level 4 is the final training, often referred to as a safety course on the road (strategic). During this training, the instructor is allowed to ride with up to three learners in real-life traffic for moped AM146 training, but in other A classes, this training is individual. AM146 is the only licence training class where one instructor is allowed to teach more than one learner in real-life traffic at the same time. At the end of Levels 2 and 3, a level assessment lesson is given where the learner, together with the instructor, assesses their own skill level. The intended purpose of these lessons is to assess whether the learner has the sufficient skill level to start training in the next level.

2.2.1. Mandatory and non-mandatory rider training

Rider training is separated into mandatory and non-mandatory training, where the mandatory parts are operationalised as process objectives linked to the more challenging themes of the training (see Table 1).

Prior to these specific training lessons for PTWs is the theoretical basis course (Level 1), mandatory for all licence classes, including cars, in Norway. Furthermore, the AM146 is a moped which has a speed limit of 45 km/h and a self-weight of maximum 350 kg. The other classes refer to motorcycles with engines larger than 50 cc and speed exceeding 50 km/h. Here, the A1 is a light motorcycle with a maximum effect of 11 kW, while the A2 and A are heavy motorcycles. The A2 has a maximum effect of 35 kW, while the A has a larger effect.

The mandatory lessons are formative assessments conducted as a

Table 1
Number of mandatory lessons in A classes and AM146.

Lessons	AM146	A1	A2	A
Theoretical basic road traffic knowledge (Level 2)	3	3	3	3
Level assessment lesson after Level 2	1	1	1	1
Safety course on traffic (tactical level)	4	4		
Safety course on precise riding technique			4	4
Level assessment lesson after Level 3	1	1	1	1
Safety course on road (strategic level, Level 4)	4	5	5	8
SUM	**13**	**14**	**14**	**17**

part of the training, and the learner's individual learning process is the basis for this assessment. Thus, no specific achievement of objectives is explicitly mentioned in the curriculum, and this is viewed as a flexible assessment. The main reason for the formative assessment for the instructor is to map the learner's development to adapt training methods for optimal learning processes for them. In addition to mandatory lessons, non-mandatory lessons are supposed to lead the learner to the next levels of the stepwise education (NPRA, 2016). In this part of the training, product objectives which mainly describe knowledge and skills are used. Such an objective is, for instance, mastering precise driving techniques, counter-steering, and so forth. These goals are explicitly described in the Norwegian road traffic regulations (Lovdata, 2019) and concretised for both the learner and the instructor on the requirements of obtaining a licence.

AM146 is the only licence class where a practical test is not required. Here, the licence is issued based on acquired age, approved health certificate, certificate of good conduct, mandatory rider training, and passing of a theoretical test consisting of thirty questions. The timeframe for completing the test is 60 min, and to pass the test, the candidate needs six or fewer errors (NPRA, 2018).

2.2.2. Instructor education in Norway

To become a PTW instructor in Norway, you must first be an authorised driver instructor for a Class B passenger car before pursuing further education specialising in the AM146. The Norwegian driver instructor education for Class B provides extensive training as it is a two-year university education with an emphasis on traffic pedagogy, road traffic law, and traffic psychology in addition to physics and technology (Nord University, 2020a). This two-year education includes both theory and practice and emphasises operational, tactical, and strategic driving skills (Michon, 1985) as well as the GDE framework (Peräaho, Keskinen, & Hatakka, 2003).

2.3. Riding school market in Norway

The number of driving schools in Norway as of March 2020 is 1056 according to the NPRA (2020b), dominated by smaller schools with one to four employees. This is a small decrease from 2017, when the number of driving schools was 1083 (NPRA, 2017; Sætren et al., 2018). No numbers of driving schools offering training for A classes were available.

The number of instructors who were educated for A classes has been stable in the past five years except for some variation for AM146. However, it was not until 2016 that a specialisation for AM146 had been offered (Table 2).

2.4. Risk factors in a competitive dynamic context

Competition in a high-risk industry always involves a balance between safety and production. An imbalance in this relationship could be a safety–production conflict, defined as 'the perceived inability to achieve joint safety and production' (McLain & Jarrell, 2007, p. 299). However, most of the literature related to this question deals with the safety climate or actions in a hazardous event (McGonagle & Kath, 2010; Stride et al., 2013). In addition to the organisations the driving schools represent, we explore the issue of safety versus production from a system perspective of the driver or rider training industry. Several theories show how to deal with risk factors from a system perspective (e.g. Hollnagel, 2009; Perrow, 1999; Rasmussen, 1997; Reason, 1990, 1997; Turner, 1978; Weick & Sutcliffe, 2015). In this study, we focus on Rasmussen's theory of mitigating towards boundaries (1997) and Reason's Swiss cheese model (1990).

Table 2
Number of educated instructors in Norway in the past five years (Nord University, 2020b).

Year	A Classes	AM146
2019	34	11
2018	36	45
2017	47	66
2016	36	4
2015	29	–

2.4.1. Mitigation towards boundaries

Several theoretical perspectives assess safety in high-risk systems. Rasmussen (1997) focuses on how decisions are made not in isolation but in a social context. Thus, the interaction of effects as a result of decisions made by people in their context must be considered. Rasmussen mentioned that the competing goals of production versus safety influence this decision-making. In this theory, boundaries illustrate the limit of where actions will lead to non-survival – for instance, for a company – but it could also be human deaths caused by accidents, serious unwanted incidents, or disasters, hence the term 'mitigation towards boundaries'. An example of such a boundary is economic failure. Others are perceived acceptable performance, error margin, and unacceptable workload. The basic idea is that decisions made in a dynamic complex social context on different levels influence how actors drift towards or away from failure. Further, different levels are part of such a systemic decision-making. According to Rasmussen (1997), these levels are, from top to bottom, the government, the regulators, the company, the management, the staff, and finally the actual work conducted. Competition is an example of a dynamic factor affecting how decisions are made and an important part in the production-versus-safety balance. As Rasmussen states, 'Commercial success in a competitive environment implies [the] exploitation of the benefit from operating at the fringes of the usual, accepted practice' (1997, p. 189). Thus, the interaction of effects of decisions made by several actors in normal working conditions must be considered. These decisions are probably made under a certain amount of pressure towards cost-effectiveness.

In short, Rasmussen's theory shows how everyday normal behaviour could lead to an accident because actions mitigate towards the boundaries of acceptable safety practice. Investigations of larger-scale accidents show that the accidents are caused not by coincidence or independent human errors but rather by larger systemic drifting towards boundaries. Thus, a focus on system behaviour is necessary. Rather than detecting single human errors, the mechanism that generates this behaviour should be the focus to make sustainable changes (Rasmussen, 1997).

2.4.2. The swiss cheese theory of system safety

Another theoretical perspective of safety in high-risk systems is propounded by Reason (1990), who distinguishes between active and latent failures. Active failures are errors where the consequences are immediately visible – for instance, when an operator makes an error that one can see at once. While active failures show a clear relationship between cause and effect, latent errors, on the other hand, are made further from the incident in time and space – for instance, an action made by a national government's or company's management which is the cause of the error. These decisions and actions are thus conducted perhaps long before the occurrence of an unwanted incident by people removed from the direct control interface but who still affect the outcome. This concept of active and latent errors is illustrated by a block of Swiss cheese (Reason, 1990, 1997). Here, each slice of cheese is a barrier, and each slice has holes that represent breaches in these barriers. Latent conditions are on one side and then layer by layer of slices, with holes representing active conditions on the other end. An accident occurs when a hole is hit in each slice; in other words, breaches in the barriers on each level are hit. Thus, latent conditions in combination with active errors could lead to a breach in the defence in depth and thus result in an unwanted incident or accident.

3. Method

We selected a qualitative approach for this study to explore a topic that is hardly investigated in scientific research. Thus, to know more from those working close to the group that we wanted to learn more about, we wanted a broad and deep explanation in this initiatory phase. The results of this study are based on sixteen semi-structured individual interviews with sixteen informants. This study is part of a larger project on the understanding of risk, behaviour, and rider training for PTWs and is reported to the Norwegian Centre for Research Data (NSD).

3.1. Researchers' backgrounds

The backgrounds of the researchers are divided into both practical and scientific experience. Two are trained instructors and work as university lecturers. Additionally, they work at driving schools as instructors. Their backgrounds are rather similar, and they have many years of experience working with PTWs and training learners as well as educating instructors. The third researcher holds a PhD in psychology and has many years of experience in industrial and safety psychology as well as human factors from different areas, such as the offshore petroleum industry and road traffic. She is further trained in qualitative methods and has spent many years lecturing on this topic for bachelor and master students in different universities. All three authors are employed at the business school faculty at Nord University and work daily with road traffic and safety-related topics.

3.2. Participants

For this study, sixteen informants were chosen because of their relevance (Kvale, 1996). The factors considered were, for instance, gender, geographical diversity in Norway, and years of experience. As the PTW training business has a majority of male instructors, fourteen informants were male, and two were female. The informants were either lecturers at Nord University, the only university in Norway that educates PTW instructors (three male informants), or instructors who trained two-wheel riders at driving schools (thirteen informants, both male and female). The latter all came from different driving schools and were distributed in different parts of Norway. In addition, their level of experience varied, from first-year instructors to those with more than twenty years of experience. Their age range was approximately 25–55 years. They were all Norwegian, and their education was based on the Norwegian road traffic educational system. Thus, they have received Norwegian driver training education which is now a part of Nord University.

3.3. Recruitment process

The informants were instructors from our network whom we asked to participate over the phone or face-to-face. However, during the interviews, we further asked if they could recommend someone we should contact. This was to promote diversity in the group of informants as well as gain contact outside our own established network. The informants were selected based on practical elements such as the time to conduct the interviews as well as an assessment of data saturation. First, ten informants were interviewed and the data analysed; subsequently, the data were considered to need more in-depth information, and six more were selected. No incentives or rewards were offered to the participants.

3.4. Data collection

The data collection took place a little over one year, and individual semi-structured interviews were used.

3.5. Interviews

The sixteen interviews were conducted either through the telephone or face-to-face, according to the informants' preferences and practical issues such as geographical distance. Each interview lasted approximately 1 hour. All the interviews were conducted individually, with only the informant and the interviewers present. The interviews were recorded and most of them transcribed. Two or three interviewers were present at every interview, and the interviewers were solely the authors of the paper.

The interview guides were semi-structured (Kvale, 1996). The interviews were divided into different topics concerning the driving school's procedures, work processes, and training processes for PTWs at the specific school and in general. The questions were, for instance, 'Can you describe how you plan and conduct training for the AM146?' and 'How do you conduct level assessment for the different A and AM classes?' The most relevant interviews (ten) were then transcribed, the others (six) listened to and partly transcribed with notes taken.

3.6. Analysis

Thematic analysis was used to analyse the data, and the software program QSR NVivo 12 was used to organise our analysis of the written data material into categories. Thematic analysis offers a flexible approach to analyse themes found in interviews (Braun & Clarke, 2006). The first step, familiarising ourselves with the data material, was done by attending the interviews and then transcribing them before reading through them. In the process, ideas regarding initial categories emerged. In NVivo, the coding of the transcribed interviews started with coding nodes into initial codes prior to developing the codes into themes. After we organised the data into meaningful groups using mind maps, we discovered the first theme, 'course-related training'. For a more in-depth analysis of this theme, we then looked into the quotes related to this and wrote memos. This process was continued, and finally, we interpreted competition to be the main theme, with the three themes 'course-related training', 'less strict assessment', and 'test-oriented training' closely related to the main theme. The theme development process was inductive, guided by the interview material rather than theory driven (Braun & Clarke, 2006).

3.7. Validity

Several approaches can be used to establish the validity of qualitative research (e.g. Elliott, Fischer, & Rennie, 1999; Kvale, 1996; Yardley, 2000). In this research, we focus on Yardley's (2000) four principles for assessing validity as well as the seven guidelines of Elliot et al. (1999). Within the context of this scientific work, validity is established, first of all, to provide transparency for the reader. Sensitivity to context, Yardley's (2000) first principle, refers to the importance of showing sensitivity to the context of the research, also present in the 'explicit scientific context' of Elliot et al. (1999) and their 'owning one's perspective'. Thus, in this work, we have described our professional backgrounds as well as shown the theoretical context for the research. Further, the sociocultural context is explained through describing the informants' backgrounds as well as the curricula and regulations of driver and rider training in Norway and, to some extent, Europe. Providing this context conforms to 'situating the sample' (Elliott et al., 1999).

Regarding the criteria of thoroughness of the data collection, analysis, and reporting, we have given insight into these elements through explanations and quotes – in accordance with commitment, rigour, and coherence (Yardley, 2000) – as well as grounded the results in examples and providing credibility checks (Elliot et al., 1999). In addition, we have all been engaged in this project from the planning phase to the writing of this paper, demonstrating commitment. Further, the selection of participants was based on the theme of the study, and the participants

were selected over a longer period to receive relevant information based on the direction of the analysis (Morrow, 2005). Additionally, transparency is linked to how the scientific process is described. Here, we have kept close to the data through collection and analysis and provided an in-depth description of the process for the reader through different sections of this paper. Thus, we believe this research has transparency.

Another important factor regarding validity is ethics (Elliot et al., 1999; Yardley, 2000). This project was approved by the NSD prior to conducting any data collection to ensure that the values and practices were permitted according to ethical guidelines and regulations. Anonymity and confidentiality were ensured, for instance, by restricting access to the sound recordings to the researchers. Additionally, the transcriptions omitted any personal information, and they were not made available to anyone other than the authors. Furthermore, all participation was voluntary, and all the informants agreed to participate after being told about the project and that they could withdraw at any time. None of the informants backed out. They also all agreed to the interviews being recorded.

4. Results

Based on the data collected and analysed, we found three main categories in which competition affected the rider training industry in Norway from a safety perspective: (1) course-related training, (2) less strict assessment, and (3) test-oriented training (Fig. 1).

4.1. Course-related training

The first factor, course-related training, relates to the youngest class group of AM146 and the licence class not requiring a practical riding test to obtain a licence. Here, we found that while the curriculum and regulations explicitly state that the training is intended to be individual, some elements indicate course training. This does not provide the individual focus to the intended degree during the training period and seems to be influenced by the societal perception of risk related to this class as well as opportunities afforded by the system to the driving schools to adjust the training.

4.1.1. Societal perception

In this subcategory, we interpret that attitudes and norms from learners and their parents as well as rider schools perceive this licence class as less dangerous than other classes. Further – and this attitude is more prevalent in rural areas – a norm dictates that 'everyone' should have access to this licence, that it is necessary for mobility to, for instance, school and visiting friends from the age of sixteen, and that riding a moped poses less danger compared to riding other motorised vehicles:

I think it has to do with rendering harmlessness. It's mostly a means of transport to get here and there. Everyone knows how to ride a moped, you know. You do not understand that someone would need extra training. It's something everyone knows how to do. It's not dangerous. I think this is the attitude.

In addition, the data shows that the expectation for obtaining a licence is connected to it being done in groups:

They often show up as a group. They are friends. They show up together. They expect the same.

Further, the learners expect that this licence should not cost much and should not take long to achieve. The informants stated that their parents often paid for the licence and training and expected that their teenagers did not need more than the minimum requirements or lessons set by the driving school. One of the reasons for this is how the driving schools tend to market their AM146 licence training, which brings up the idea of a course. Mandatory lessons are often booked by the driving schools in advance so that the dates and times are set when the learner books the training. Often these lessons are booked close in time, such as two consecutive days, for efficiency. According to our informants, this makes the learners and their parents perceive the training as a course rather than individually organised, and the parents are often surprised if the trainers state that their children need more training lessons. We interpret the need for such an explanation as a perception of it as a course and that some surprise lessons may accompany scheduled ones. For other classes (PTWs and cars), the informants stated that they would not schedule lessons prior to meeting the learner. Instead, they would meet them and, from there, decide on the training based on the skill level. This organisation of moped training is further affected by how the nearby schools organise it:

We were a victim of the competition … We started right but found out that we were out of the market.

Individual focus costs more time and money, and one driving school lost many learners and thus an important basis for their income and explicitly stated that they needed to organise the training as a course without actually calling it a course, as did other driving schools in close proximity.

4.1.2. Opportunities afforded by the system to adjust training

Even though the intention of the AM146 curriculum and regulations is clearly stated as involving individual focus, some elements of the regulatory system seem to provide opportunities against individual training. First of all, the AM146 system allows for three learners at a time, which makes it harder for the driving schools to apply individual focus as it would raise the costs for a lesson. Second, no practical test is taken at the end. For all other licence classes, a practical test is required. However, for moped training, only a theoretical test as well as mandatory lessons are the minimum requirements, making the instructor the final assessor. Third, a set number of mandatory lessons are given. Most of the informants agreed that these mandatory lessons are not sufficient to receive the licence. However, they stated examples of organising the training in such a way that in addition to the mandatory lessons, the school, for instance, includes three additional lessons and sells this as a package resembling a course. One informant stated.

We have three extra lessons prior to [the] safety course in traffic. I have never had a learner … [who] needed more than these three lessons. Everyone has made it based on these three extra lessons and been good enough.

4.2. Less strict assessment

Instructors assessing when the learners are fit for rider licences is another factor in which competition affects the rider training industry from a safety perspective. This is because the demand for efficiency found among AM146 learners and their parents might lead to a less strict assessment for these learners than for others:

Without competition, I would probably spend more time with each learner … Now I get a guilty conscience because I should have given an extra lesson. But I think the learner … is okay according to minimum

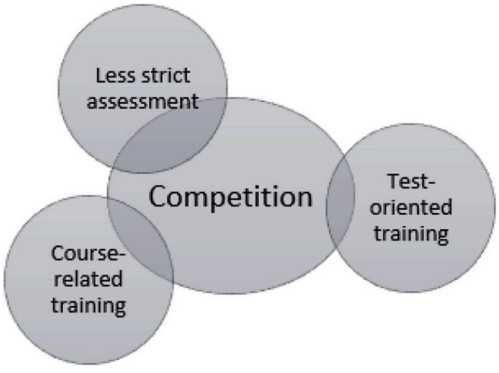

Fig. 1. Factors related to competition affecting rider training from a safety perspective.

requirements. I'll drop it. It's too hectic.

In addition, the curriculum and regulations clearly state which skills are supposed to be assessed. Reflections of theory and one's own practice, for instance, are such examples. However, the technical skills seem to be more prominent in these assessments, and several of our informants stated that they had made their own assessments rather than followed the curriculum's written statements:

I have my own minimum requirements I have set based on my own experience.

This being said, some used the curriculum during the training to show the learner the goals for the lessons. This means that the final AM146 assessment might vary to a large degree. As one informant stated.

It feels like we are selling a moped licence.

This indicates that the training and learning process were not focused on; rather, the minimum skills were the final goal for both the instructors and the learners. The NPRA often leads inspections at the schools to see whether the training is conducted in accordance with the rules and regulations. However, the schools also have a degree of freedom on how to interpret the curriculum and choose their training methods.

4.3. Test-oriented training

Test-oriented training was found to be related to the A classes that required practical riding tests. We found that the intention of the curriculum was somewhat adjusted and that training for A classes often focused more on the final practical test rather than the learning process. In other words, the aim for the learners and instructors was found to be more related to passing the test than ensuring safety as much as possible. The content and structure of the practical test itself are possible contributing factors. Elements of this test include braking, cornering around cones, and balance exercises on a closed-track off-road location. Many learners find this exercise challenging. Thus, this is often rehearsed precisely, as is done on the test, to pass:

Many of the technical exercises in the off-road location are … directed towards the rider test, especially the balance exercises … I think the final rider test is directive for many.

Several informants stressed that they would not have spent much time on, for instance, balance exercises if they did not focus on this particular exercise in the test. Many felt that this exercise was not that relevant to be safe motorcycle riders and road users and would have spent that time on other elements:

I bet no instructor would spend up to six lessons on off-road balance exercises if it wasn't for the rider test.

Another example is how the final lesson, just prior to the test, often consists of final preparations on how to make the learner pass the test:

Here [in the rehearsal lesson], a lot of emphasis is put on work the learner … has been struggling with. [It] could be correction on speed towards pedestrian crossing or balance rehearsals. Advice is given, concrete advice on 'remember this and this'.

These quotes indicate that the instructors aim for the practical test in parts of the training, which might help learners who should have had more exercises pass the test because of last-minute specialised prepping.

5. Discussion

The study finds that competition affects three factors of the rider training system related to safety: (1) course-related training, (2) less strict assessment, and (3) test-oriented training. Next, we will discuss the research question: 'How can competition affect the quality of the rider training system and thus road safety in Norway?' This discussion will be based on the findings and the presented literature in the theoretical framework.

5.1. Competition and rider training and road safety in Norway

The findings can be related to the categories of the theory of mitigations towards boundaries (Rasmussen, 1997), which are (1) acceptable performance, (2) workload, and (3) financial failure. The theory was originally designed for larger complex systems and to explain major accidents (Le Coze, 2015), but the idea can be used for the complexity of road traffic as well, and even though road accidents are usually smaller than major accidents in, for instance, the petroleum or nuclear power plant industries, they might be just as complex. In road traffic, more specifically rider training, the category of acceptable performance could be linked to the operator, in this case the rider. The training quality is reflected in the rider's competence. The second category, workload, could be related to the instructor. AM146 is the only licence category where the instructor is allowed to have more than one learner (three at a time) in traffic. In addition, all the training for PTW classes takes place during the summer season, and thus, the instructors are further pressured to fulfil the training during this period. These workload examples, should they lack attention, could be viewed as mitigating to the boundaries. The third category, financial failure, will depend on the number of learners in a driving school.

The instructor might encounter difficulty in seeing the long-term effect of a normal everyday work action. A human error (Reason, 1990) – such as a rider making the wrong decision, causing an accident – can be seen as a single error releasing a dynamic flow of events. Investigating the accident then makes it easier to blame the individual causing it. However, this individual's decisions depend on those made by other people in other departments and organisations further away from the actual accident, which are latent factors (Reason, 1990). This systemic picture is harder to observe and also harder to trace back.

We found that the AM146 rider class seemed to be most affected by competition in a safety matter, which is the licence class for the youngest riders as well as the only class that does not require practical tests. In addition, this is the only class where more than one learner is allowed to train with an instructor in real-life traffic. Thus, this might be the 'easiest' class for the driving schools to adjust to. This is, moreover, the age group with the least experience, and this might entail their first encounter with road traffic as motorised vehicle actors. Thus, for them to have the least training of all the classes seems paradoxical and a reason why this group tops the statistics of unwanted incidents (Sagberg & Johansson, 2018). However, their vehicle is the moped, which is not allowed to travel faster than approximately 45 km/h and thus seldom leads to road deaths. Still, some of the moped rider's obtained skills and attitudes towards road traffic may be transferred if they later acquire a car licence.

Since this licence class is more easily adjusted, competition might lead the management to make decisions from a production point of view rather than a long-term safety perspective. A basic problem, according to Rasmussen (1997), is that a boundary violation may not have immediate effects. This means that even though the schools offer training that does not correspond to the intentions of the curriculum, it will not be immediately visible in accident statistics. Regarding defence in depth (Reason, 1990), such findings could thus be related to latent errors because rider training will not be part of an investigation of errors made in an accident. Further, those making the curriculum and legal requirements are not part of day-to-day operations. The rider's actions in a given situation are instead defined as active errors. An accident could, however, be caused by latent factors, including the training quality.

5.1.1. Course-related training

Regarding the first category, course-related training, the way that driving schools organise their training complies with the law and legal requirements. However, these requirements allow for an organisation of the training that may not adhere to the intentions of the curriculum – for instance, by allowing for three learners at once. This element promotes a collective way of organising the training as a course including more

learners rather than individual training, which is the curriculum's intention. Coordinating individual training and having three learners ready for traffic-level training without this taking more time than what the learners expect and are willing to pay for may be a challenge. When other nearby schools offer more efficient training in less time, the school which interprets the intention of the curriculum as individual training, which takes more time and costs more, is placed in a difficult situation. Thus, organising the training as a course without calling it a course, as our informants stated, is easier. Further, even though schools organise the training as a course, some still seem to be balancing on the boundary of financial failure (Rasmussen, 1997) as the market's willingness to pay for this training is affected by the perception that this training is supposed to be fast and cheap and that driving a moped is less dangerous than driving other motorised vehicles. In addition, research shows that AM146 learners seldom read theory during the practical training and only read it right before the theoretical test (Sætren & Wigum, 2019) because the practical training period is compressed, which leads to little time to read theory. As a safety aspect, this could be unfortunate as the intention of the curriculum is to learn and reflect on theory and practice (NPRA, 2016).

5.1.2. Less strict assessment

Training which is as fast and cheap as possible could result in instructors moving learners to the next level before sufficient skills are obtained. AM146 is the only licence group which does not require a practical test and is the group with the highest accident rate one year after obtaining the licence (Sagberg & Johansson, 2018). Apart from economic reasons for this, another reason might be that if the training is too efficient, whether the instructor has sufficient knowledge of the skill and learner's reflection level for optimal evaluation could be questioned.

Further, some instructors made their own mandatory assessments based on their experience rather than on the regulations and curriculum. Thus, whether the objectives based on regulations are met or not could be up for discussion. In addition, one could compare road traffic with other high-risk contexts such as surgery, piloting, and so forth. In most of these contexts, training is an important asset that the organisation invests in, and the personnel are selected based on exemplary skills. However, a young and inexperienced candidate only has to pass a theoretical test for AM146, not even a practical test, to operate a motorised vehicle in traffic, which could be a safety challenge. Operators in high-risk industries train and reflect upon their operations on a daily basis, but this is not how it works for road traffic. After obtaining a licence, a rider is not obliged to pass any further tests. This is one of the reasons why the intentions of the curriculum (NPRA, 2016) reflect and are connected to theory and practice for the rider to continue developing road safety skills even after the licence is obtained (especially for the AM146, which often entails the first encounter with traffic for many). Riding a moped is viewed on a societal level as something 'everyone' masters and which is not very dangerous. Society seems to accept this risk. This leads to a certain level of accidents being accepted as normal because of the degree of freedom for people in society, including riders (Perrow, 1999; Rasmussen, 1997). Further, within road traffic, which is a context of individuals and their choices, the level between the authorities' inspection and the operator is missing. In other words, in organisations, a level of managers helps keep safety in focus on a regular basis. Thus, rider safety would benefit from more thorough rider training before the riders can be accepted in real-life traffic situations on their own, making their own decisions, especially for younger inexperienced riders. However, this entails a discussion of pricing and the society's willingness to pay and thus a question of whether a licence should be low-priced for the majority of people to obtain versus the level of road traffic safety.

5.1.3. Test-oriented training

This third category pertains to classes that have final practical tests. Here, the intention of the curriculum (NPRA, 2016) is that the final test itself is not a target but measures some other elements – which include reflection, an understanding of one's own actions, risk perception, and so forth – meant to further develop even after the test. Being able to handle the motorcycle technically or to understand road traffic rules and regulations alone is not sufficient. Being safe in traffic presents a broader picture. If the instructor practices only coaching, where the learner masters specific yet commonly used test routes and is prepped to pass the test, the learner may not have a thorough understanding of the road traffic system and her or his own role in it. The examiner could get an inaccurate picture of the learner during the test, passing them based only on the practical elements of the test. According to the GDE matrix (Keskinen et al., 2010), which the curricula (NPRA, 2016) is based on, a rider must practice self-awareness, know the consequences of different actions in traffic, and ride according to a low risk based on risk perception. This should be thoroughly taught during rider training so that the rider can continue to develop such skills after the actual test. Test-oriented training will, for this reason, potentially fail according to all the levels of the GDE matrix, and thus, the learning process will lack the reflection, risk perception, and self-awareness sought in the curriculum. Instructors and driving schools that train only in areas where the test will be conducted coach the learner to master these particular contexts but not the broader perspective. These tests are designed to pick a small part of the training course to master, not necessarily the same part every time, but the idea is that if the learner masters these elements, she or he might know more than only the test elements because of a broader training regime. The learner who is coached only for the test might not know the in-depth strategies of attention and information processes sufficiently for mastering other traffic contexts. Thus, the test could be passed on the wrong basis.

The safety–production imbalance (Rasmussen, 1997), in this case, seems to prioritise efficiency over safety. All three categories are focused on faster processes and lower costs and thus conform to the forces of supply and demand despite the intentions of the curriculum and regulations. However, the curriculum is intended for the learner to mature during the training and learn skills step by step, including reflection, self-assessment, and risk perception (NPRA, 2016). If the training is conducted as a course with scheduled lessons, it does not consider individual differences in maturing and obtaining a sufficient in-depth understanding of how the theory relates to practice. Further, if the instructor is the assessor, their assessments might be conducted slightly more generously than if there were an external practical examiner. The findings also indicate that the training focuses more on the final practical test than on the learning process. By focusing on the practical elements of the test and prepping the learners accordingly, fewer lessons are needed, resulting in increased efficiency. This is not necessarily the safest route as Norwegian road traffic training stresses step-by-step training, the time to mature, and the reflection and understanding of risks in addition to rules and regulations. A thorough learning process is hard to assess with a final external examination and is thus expected to be taken care of by the driving schools.

In short, Rasmussen's theory shows how everyday normal behaviour could lead to accidents because actions mitigate towards the boundaries of acceptable safety practice. This could mean that the school organises the training more on the production level than the safety level – defined as course-based training, less strict assessment, and test-oriented training – rather than fostering the learning process, which puts safety as its first priority, all of which could occur because of competition. Often when competition is put between safety and production, production wins because it is more visible and has faster effects than the slow work of safety. This goes for rider training as well. The learner seems to handle the motorcycle and pass the test, or their assessment meets the minimum requirements, but their broader understanding of road traffic safety, their reflection of their own behaviour, and their knowledge of how to be safe vehicle operators in road traffic might not be the priority for the driving school if efficiency and cost from

competition are dominating factors. Research from other high-risk industries shows that training might not be prioritised for reasons such as cost, time, and a lack of understanding of its importance (Sætren & Laumann, 2015).

5.2. Impact and further research

This research impacts on the understanding of how rider training is organised. First of all, it gives the NPRA inspections department elements to evaluate and look for with regard to how the training is established. Second, it gives a basis for how training organisation for all A classes might be improved. Third, it suggests how the regulations and curricula could be adjusted, and fourth, it provides a foundation for policymakers to see how the system affects production in this industry.

Nevertheless, further research will benefit the industry. For instance, it can evaluate how rider training is conducted throughout Norway with quantitative measures in addition to more observations. This must be established to evaluate how such training affects road safety. For example, an in-depth analysis of establishing accident statistics based on the origin of training could be important. This is to see whether there are differences in which schools the moped riders went to (and thus which training systems they had) and if this affects the number of road accidents. This includes exploring if the moped riding training should be conducted as group training or individual training, like the other licence classes. Additionally, an analysis of buyers' price elasticity as well as knowledge of and the demand for quality in training will be of interest for gaining an in-depth understanding of the market, together with price formation and differences. Another factor is to consider a more detailed competition situation from a competition theory aspect rather than a system perspective, as in this paper. Finally, given a lack of understanding how this market looks, a thorough market analysis and description would be beneficial to understand how this segment develops and how it can be affected by different measures.

6. Conclusion

Because of the high accident rate of PTWs, we looked into competition as an aspect of rider training that could influence rider safety. Thus, the research question was 'How can competition affect the quality of the rider training system and thus road safety in Norway?' We found that competition does affect the rider training industry in Norway. Elements of rider training that influence safety quality include (1) course training rather than individual follow-up, (2) assessments that are less strict because of the absence of practical tests for AM146, and (3) test-oriented training for the PTW classes that do not focus on safety reflection in the long term. Both the system and the culture, in a competitive environment, seem to contribute to the failure of actual rider training to meet the intentions of the curriculum and regulations regarding training quality and thus road safety.

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